PLINY

NATURAL HISTORY

IN TEN VOLUMES

I

PRAEFATIO, LIBRI I, II

WITH AN ENGLISH TRANSLATION

BY

H. RACKHAM, M.A.

FELLOW OF CHRIST'S COLLEGE, CAMBRIDGE

CAMBRIDGE, MASSACHUSETTS

HARVARD UNIVERSITY PRESS

LONDON

WILLIAM HEINEMANN LTD

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NATURAL HISTORY

I

PRAEFATIO, LIBRI, I, II

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First Printed . . 1938
Reprinted 1944
Revised and reprinted . 1949
Reprinted 1958
Reprinted 1967

PRINTED IN GREAT BRITAIN BY ROBERT MACLEHOSE AND CO. LTD
THE UNIVERSITY PRESS, GLASGOW

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PREFATORY NOTE

The need for a new edition of this volume allows me to correct some misprints and mistakes in the text and translation. I am gratified to reviewers for pointing out a few that I had not noticed myself. Some of the mistakes of nomenclature were due to the plan of publication, which precluded postponing Book I, Pliny's Table of Contents, till the whole of the treatise had been worked through and the objects mentioned had been so far as possible identified by his descriptions.

H. R.

October, 1943.

INTRODUCTION

Gaius Plinius Secundus—usually called Pliny the Elder to distinguish him from his nephew and ward, Gaius Plinius Caecilius Secundus, whose collected correspondence has preserved such a vivid picture of Roman life in the time of Trajan—belonged to a family of wealth and position in the North of Italy. He was born at Como in A.D. 23. After studying at Rome he started when twenty-three years old on an official career, serving in Germany under L. Pomponius Secundus, and rising to the command of a cavalry squadron. Seven or eight years later he came back to Rome and took up the study of law. During most of Nero's principate he lived in retirement, but towards the close of it he re-entered public life and became Procurator in Spain. He held this post until Vespasian won the principate, when he returned to Rome and was admitted to the Emperor's intimate circle; they had been acquainted in earlier days when at the front in Germany. He also launched into another field of activity, receiving a naval commission.

Throughout his busy career as a man of action he had kept up a constant practice of study and authorship. His interest in science finally cost him his life, at the age of 56. He was in command of the fleet at Misenum on the Bay of Naples in A.D. 79

when the famous eruption of Vesuvius took place on August 23 and 24, overwhelming the little towns of Herculaneum and Pompeii. Pliny as a man of science sailed across the bay to obtain a nearer view; he landed at Stabiae, and there was killed by poisonous fumes. The circumstances are recorded by his nephew in a letter to Tacitus (Pliny, *Epp.* VI. xvi). Vespasian had died and had been succeeded as Princeps by his son Titus two months before.

Pliny's earlier writings were on subjects suggested by his professional experiences, *e.g.*, the use of the javelin by cavalry, a history of the German wars, the training of the orator. During his retirement he produced *Dubius Sermo*, a treatise on grammar, and later a continuation down to his own time of the history of Rome by Aufidius Bassus; and lastly *Natural History*, the largest and most important of his works and the only one that has survived, although his historical writings on the defence of the German frontier and on the events of his own period were clearly works of value, the loss of which is much to be regretted. The substance of both, however, is doubtless largely incorporated in the writings of Tacitus and Suetonius, the former indeed repeatedly citing Pliny as his authority both in *Annals* and in *Histories*.

Natural History is dedicated to Titus, who is referred to in the Preface, § 3, as 'sexies consul'; this dates the completion of the work at A.D. 77, two years before the author's death and the accession of Titus. It is an encyclopaedia of astronomy, meteorology, geography, mineralogy, zoology and botany, *i.e.* a systematic account of all the material objects that are not the product of man's manu-

facture; but among these topics, which are implied by the title, Pliny inserts considerable essays on human inventions and institutions (Book VII), as well as minor digressions on similar subjects interspersed in various other parts of the work. He claims in his Preface that the work deals with 20,000 matters of importance, drawn from 100 selected authors, to whose observations he has added many of his own; some of the latter he has indicated as they occur, and there are doubtless others not so labelled, but even so they form only a small fraction of the work, which is in the main a second-hand compilation from the works of others. In selecting from these he has shown scanty judgement and discrimination, including the false with the true at random; his selection is coloured by his love of the marvellous, by his low estimate of human ability and his consciousness of human wickedness, and by his mistrust of Providence. Moreover his compilations show little methodical arrangement, and are sometimes unintelligible because he fails to understand his authority, or else because he gives wrong Latin names to things dealt with by his authorities in Greek.

Nevertheless it is a mistake to underrate the value of his work. He is diligent, accurate, and free from prejudice. Though he had no considerable first-hand knowledge of the sciences and was not himself a systematic observer, he had a naturally scientific mind, and an unaffected and absorbing interest in his subjects. If he gives as much attention to what is merely curious as to what has an essential importance, this curiosity has incidentally preserved much valuable detail, especially as regards the arts; moreover anecdotes that used to be rejected by critics as

erroneous and even absurd have now in not a few cases been corroborated by modern research. The book is valuable as an anthropological document: it is a storehouse of scattered facts exhibiting the history of man's reaction to his environment—the gradual growth of accurate observation, of systematic nomenclature and of classification, *i.e.* of Natural Science.

Pliny's own general attitude towards life, like that of other educated men of his day, may be styled a moderate and rational Stoicism.

A vivid account of his authorship written by his nephew may be appended here. The younger Pliny in reply to an enquiry from a friend, a great admirer of his uncle, gives (*Epistles*. III, v) a full list of his works, numbering seven in all and filling 102 *libri* or volumes. Of these the *Naturae historiarum* (*libri*) *triginta septem* is the latest. He calls it (§ 6) *opus diffusum, eruditum, nec minus varium quam ipsa natura*; and he goes on to describe by what means a busy lawyer, engrossed in important affairs and the friend of princes, contrived to find time for all this authorship (§ 7): 'He had a keen intelligence, incredible devotion to study, and a remarkable capacity for dispensing with sleep. His method was to start during the last week of August rising by candlelight and long before daybreak, not in order to take auspices but to study; and in winter he got to work at one or at latest two a.m., and frequently at 12 p.m. He was indeed a very ready sleeper, sometimes dropping off in the middle of his studies and then waking up again. Before dawn he used to wait on the Emperor Vespasian, who also worked during the night; and then he went off to the duty

assigned to him. After returning home he gave all the time that was left to study. Very often after lunch—with him a light and easily digested meal, as the fashion was in old days—in the summer, if he had no engagements, he used to lie in the sun and have a book read to him, from which he made notes and extracts; he read nothing without making extracts from it—indeed he used to say that no book is so bad but that some part of it has value. After this rest in the sun he usually took a cold bath, and then a snack of food and a very short siesta, and then he put in what was virtually a second day's work, going on with his studies till dinner-time. Over his dinner a book was read aloud to him and notes were made, and that at a rapid pace. I remember that one of his friends, when the reader had rendered a passage badly, called him back and had it repeated; but my uncle said to him, " Surely you got the sense? " and on his nodding assent continued, " Then what did you call him back for? This interruption of yours has cost us ten more lines! " Such was his economy of time. He used to leave the dinner table before sunset in summer and less than an hour after it in winter—this rule had with him the force of law. These were his habits when in the thick of his engagements and amid the turmoil of town. In vacation, only the time of the bath was exempted from study; and when I say the bath I mean the more central portions of that ritual, for while he was being shampooed and rubbed down he used to have something read to him or to dictate. On a journey he seemed to throw aside all other interests and used the opportunity for study only: he had a secretary at his elbow with book and tablets, his hands in

winter protected by mittens so that even the inclemency of the weather might not steal any time from his studies; and with this object he used to go about in a chair even in Rome. Once I remember his pulling me up for going somewhere on foot, saying "You need not have wasted those hours!"—he thought all time not spent in study wasted. This resolute application enabled him to get through all those volumes, and he bequeathed to me 160 sets of notes on selected books, written on both sides of the paper in an extremely small hand, a method that multiplies this number of volumes! He used to tell how during his Lieutenant-governorship in Spain he had an offer of £3,500 for these notes, and at that date they were considerably fewer in number.'

Text

A large number of MS. copies of Pliny's *Natural History* have been preserved; the oldest date back to the 9th or possibly the 8th century A.D. Attempts have been made by scholars to class them in order of merit, but it cannot be said that even those that appear to be comparatively more correct carry any paramount authority, or indeed show much agreement on doubtful points, while the mass of scientific detail and terminology and the quantity of curious and unfamiliar erudition that the book contains has necessarily afforded numerous opportunities for copyists' errors and for the conjectural emendation of the learned. Many of the textual problems raised are manifestly insoluble. Only a few variants of special interest are given in this edition.

Many editions have been printed, beginning with

that published by Spira at Venice, 1469, an edition by Beroaldus published at Parma, 1476, and that of Palmarius at Venice, 1499. Commentaries start with *Hermolai Barbari Castigationes Plinianae, Romae*, 1492, 3.

The text of the present edition is printed from that of Detlefsen, Berlin, 1866; it has been checked by the Teubner edition of Ludwig von Jan re-edited by Karl Mayhoff in two volumes, 1905, 1909 (Volume I reissued 1933), which is admirably equipped with textual notes.

Useful are the commentary by G. Brotier *in usum Delphini* (1826); *Pliny: Chapters on the Hist. of Art* by K. Jex-Blake and E. Sellers (1896) and more recently *Pliny's Chapters on Chemical Subjects* by K. C. Bailey (1929-); and D. J. Campbell's commentary on Book II (1936).

Volume I: Contents

Pliny's Preface. This is in the form of a covering letter from Pliny, to accompany the gift of his treatise on Natural History to his friend Vespasian Caesar (*i.e.* the ruling Emperor Vespasian's son, Titus, his successor as Princeps, who had already been vested with *Imperium* and *Tribunicia Potestas*). The reference to him in § 3 dates the passage: see above, p. viii. The author goes on to say that this dedication places the work outside the class of books intended for the general reader, and invites serious criticism. The subject does not admit of an elevated style—the treatise is a plain record of the facts of Nature, designed for utility

and not for entertainment. Its compilation has occupied the leisure left to the author by the claims of public duty. The authorities drawn upon are faithfully recorded. The matter-of-fact title, in place of some fanciful label, indicates the author's aim, and the practical object of the work is aided by the table of contents that forms Book I, enabling the reader to turn to any particular subject that he desires to look up.

Book I: Table of Contents of the remaining thirty-six Books, the contents of each Book being followed by a list of the previous writers used as authorities.

Book II (see Book I *init.*): Cosmology, astronomy, meteorology, geography, geology.

PLINY
NATURAL HISTORY

PLINII NATURALIS HISTORIA

PREFATIO

PLINIUS SECUNDUS VESPASIANO SUO S

LIBROS Naturalis Historiae, novicium Camenis Quiritium tuorum opus, natos apud me proxima fetura licentiore epistula narrare [1] constitui tibi, iucundissime imperator—sit enim haec tui praefatio, verissima, dum maximi consenescit in patre—

namque tu solebas
nugas esse aliquid meas putare [2]

ut obiter emolliam Catullum concerraneum [3] meum —agnoscis et hoc castrense verbum—(ille enim, ut scis, permutatis prioribus syllabis duriusculum se [4] fecit quam volebat existimari a Veraniolis suis et
2 Fabullis), simul ut hac mea petulantia fiat quod proxime non fieri questus es in alia procaci epistula

[1] nuncupare *edd.*
[2] *Haupt*: esse aliquid meas putare nugas *codd.*
[3] *v.l.* conterraneum. [4] [se] ? *Rackham.*

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[a] The Emperor Titus.
[b] Edd. cj. *nuncupare*, 'dedicate,' 'assign to your name.'
[c] Catullus i 3 f.
[d] *Concerraneum* = *concerronem* or *congerronem* 'boon-companion' (one who *congerit*, contributes to a feast).

PLINY NATURAL HISTORY

PREFACE

PLINIUS SECUNDUS TO HIS DEAR VESPASIAN [a] GREETING

MOST Gracious Highness (let this title, a supremely true one, be yours, while that of 'Most Eminent' grows to old age with your sire)—I have resolved to recount [b] to you, in a somewhat presumptuous letter, the offspring of my latest travail, my volumes of Natural History (a novel task for the native Muses of your Roman citizens)—

For 'twas e'er your way
To deem my trifles something worth [c]

—to give a passing touch of polish to my 'opposite number' [d]—you recognize even this service slang—Catullus (for he, as you know, by interchanging the first syllables [e] made himself a trifle harsher [f] than he wished to be considered by his 'darling Veraniuses and Fabulluses') [g] and at the same time that my present sauciness may effect what in the case of another impudent letter of mine lately you complained

[e] Catullus wrote *meas esse aliquid putare nugas.*
[f] Perhaps alter Latin to give 'made it a little harsher than he wished it to be thought.'
[g] Catullus xii. 16, *ut Veraniolum meum et Fabullum.*

nostra, ut in quaedam acta exeat, sciantque omnes
3 quam ex aequo tecum vivat imperium, triumphalis et censorius tu sexiesque consul ac tribuniciae potestatis particeps et (quod his nobilius fecisti dum illud patri pariter et equestri ordini praestas) praefectus praetorii eius, omniaque haec rei publicae—et nobis quidem qualis in castrensi contubernio! nec quicquam in te mutavit fortunae amplitudo nisi
4 ut prodesse tantundem posses ut velles. itaque cum ceteris in venerationem tui pateant omnia illa, nobis ad colendum te familiarius audacia sola superest. hanc igitur tibi imputabis, et in nostra culpa tibi ignosces. perfricui faciem, nec tamen profeci, quoniam alia via occurris ingens et longius
5 etiam submoves ingenii fascibus: fulgurat in nullo umquam verius dictatoria vis eloquentiae, tribunicia potestas facundiae. quanto tu ore patris laudes tonas! quanto fratris famam[1]! quantus in poetica es! o magna fecunditas animi—quemadmodum fratrem quoque imitareris excogitasti!

6 Sed haec quis possit intrepidus aestimare subiturus ingenii tui iudicium, praesertim lacessitum? neque enim similis est condicio publicantium et nominatim

[1] famam *Rackham*, famas *Detlefsen*: amas *codd.*

of as not coming off—that it may result in something getting done, and everyone may know on what equal terms the empire lives with you—you with a triumph to your name and censorial rank, six times consul, colleague in tribune's authority, and (a service that you have made more illustrious than these in rendering it equally to your father and to the equestrian order) commander of his bodyguard; and all this in your public life—and then what a good comrade to us in the companionship of the camp! Nor has fortune's grandeur made any change in you save in enabling you to bestow all the benefit you desire. Consequently as all those methods of paying you reverence are open to everybody else, to me is left only the presumption of treating you with more intimate respect. For that presumption therefore you will debit the responsibility to yourself, and will grant yourself pardon on the score of my offence. I have tried to put on a bold face, and yet have not succeeded, as your grandeur meets me by another route and the rods of office that your genius bears make me move on yet further: in no other person ever radiate more genuinely the dictatorial power of oratory and the tribunician authority of wit! How eloquently you thunder forth your father's praises and your brother's fame! How great you are in the poet's art! O mighty fertility of genius—you have contrived a way to imitate your brother also!

But who could judge the value of these compositions with confidence when about to submit to the verdict of your talent, especially when that verdict has been invited? for formal dedication of the work to you puts one in a different position from

tibi dicantium. tum possem dicere: Quid ista legis, imperator? humili vulgo scripta sunt, agricolarum, opificum turbae, denique studiorum[1] otiosis: quid te iudicem facis? quom hanc operam condicerem, non eras in hoc albo: maiorem te sciebam quam ut
7 descensurum huc putarem! praeterea est quaedam publica etiam eruditorum reiectio: utitur illa et M. Tullius extra omnem ingenii aleam positus, et (quod miremur) per advocatum defenditur:

nec doctissimis.
Manium Persium haec legere nolo, Iunium
Congum volo.

quod si hoc Lucilius, qui primus condidit stili nasum, dicendum sibi putavit, Cicero mutuandum, praesertim cum de re publica scriberet, quanto nos causatius ab
8 aliquo iudice defendimus? sed haec ego mihi nunc patrocinia ademi nuncupatione, quoniam plurimum refert sortiatur aliquis iudicem an eligat, multumque apparatus interest apud invitatum hospitem et
9 oblatum. cum apud Catonem, illum ambitus hostem et repulsis tanquam honoribus inemptis gaudentem, flagrantibus comitiis pecunias deponerent candidati, hoc se facere pro innocentia quod in rebus humanis

[1] *v.l.* studiosorum.

[a] Cic. *De Or.* II. 25. Nam ut C. Lucilius . . . dicere solebat ea quae scriberet neque ab indoctissimis se neque a doctissimis legi uelle, quod alteri nihil intelligerent, alteri plus fortasse quam ipse; quo etiam scripsit *Persium non curo legere* (hic enim fuit, ut noramus, omnium fere nostrorum hominum doctissimus), *Laelium Decimum volo* (quem cognouimus uirum bonum et non illiteratum, sed nihil at Persium): sic ego—Brotier thinks that Pliny refers to Cicero's preface (now lost) to *De Republica* (as implied below) and that there the quotation differed from that in *De Oratore*; but Wilkins (*de Or.* I. 256) suggests that Cicero here merely substitutes the name of a friend of his own.

mere publication. In the latter case I could have said: 'Why does your Highness read *that*? It was written for the common herd, the mob of farmers and of artizans, and after them for students who have nothing else to occupy their time: why do *you* put yourself on the jury? You were not on this panel when I took the contract for this undertaking: I knew you to be too great for me to think you likely to descend to this! Moreover even in the court of learning there is an official procedure for challenging the jury: it is employed even by Marcus Cicero, who where genius is in question stands outside all hazard. It may surprise us, but Cicero calls in the aid of council—

. . . nor yet for the very learned;
Manius Persius I don't want to read this, I want
Junius Congus.

But if Lucilius, the originator of critical sniffing, thought fit to say this, and Cicero to quote it, especially when writing his *Theory of the Constitution*, how much more reason have we to stand on the defensive against a particular juryman?[a] But for my part at the present I have deprived myself of these defences by my nomination, as it matters a great deal whether one obtains a judge by lot or by one's own selection, and one's style of entertainment ranks quite differently with a guest one has invited and one who has offered himself. The candidates in a hotly contested election deposited sums of money with Cato, that resolute foe of corruption, who enjoyed a defeat at the polls as an honour obtained free of charge; and they gave out that they did this in the defence of the highest among human possessions, their inno-

summum esset profitebantur. inde illa nobilis M.
Ciceronis suspiratio: 'O te felicem, M. Porci,
10 a quo rem inprobam petere nemo audet!' cum
tribunos appellaret L. Scipio Asiaticus, inter quos
erat Gracchus, hoc adtestabatur vel inimico iudici
se probari posse: adeo summum quisque causae
suae iudicem facit quemcumque eligit—unde pro-
11 vocatio appellatur. te quidem in excelsissimo generis
humani fastigio positum, summa eloquentia, summa
eruditione praeditum, religiose adiri etiam a salut-
antibus scio, et ideo curari,[1] ut quae tibi dicantur
tui digna sint. verum dis lacte rustici multaeque
gentes et mola tantum salsa litant qui non habent
tura, nec ulli fuit vitio deos colere quoquo modo
posset.

12 Meae quidem temeritati accessit hoc quoque, quod
levioris operae hos tibi dedicavi libellos: nam nec
ingenii sunt capaces, quod alioqui in nobis perquam
mediocre erat, neque admittunt excessus aut orationes
sermonesve aut casus mirabiles vel eventus varios,
13 iucunda dictu aut legentibus blanda. sterilis materia,
rerum natura, hoc est vita, narratur, et haec sordi-
dissima sui parte, ac plurimarum rerum aut rusticis
vocabulis aut externis, immo barbaris, etiam cum
14 honoris praefatione ponendis. praeterea iter est
non trita auctoribus via nec qua peregrinari animus
expetat: nemo apud nos qui idem temptaverit

[1] curari *Rackham*: curavi *aut* cura *codd.*

cence. This was the occasion of that famous sigh of Cicero—'O happy Marcus Porcius whom no one dares to ask for something underhand!' Lucius Scipio Asiaticus by appealing to the tribunes, one of them being Gracchus, testified that his case could be made good even to an unfriendly judge: in fact a judge whom one chooses oneself one makes the supreme arbiter of one's case—this is the source of the term 'appeal.' You yourself indeed, I know, being placed on the loftiest pinnacle of all mankind, and being endowed with supreme eloquence and learning, are approached with reverential awe even by persons paying a visit of ceremony, and consequently care is taken that what is dedicated to you may be worthy of you. However, country folk, and many natives, not having incense, make offerings of milk and salted meal, and no man was ever charged with irregularity for worshipping the gods in whatever manner was within his power.

My own presumption has indeed gone further, in dedicating to you the present volumes—a work of a lighter nature, as it does not admit of talent, of which in any case I possessed only quite a moderate amount, nor does it allow of digressions, nor of speeches or dialogues, nor marvellous accidents or unusual occurrences—matters interesting to relate or entertaining to read. My subject is a barren one—the world of nature, or in other words life; and that subject in its least elevated department, and employing either rustic terms or foreign, nay barbarian, words that actually have to be introduced with an apology. Moreover, the path is not a beaten highway of authorship, nor one in which the mind is eager to range: there is not one person to be found among

invenitur, nemo apud Graecos qui unus omnia ea tractaverit. magna pars studiorum amoenitates quaerimus, quae vero tractata ab aliis dicuntur inmensae subtilitatis obscuris rerum in tenebris premuntur. ante omnia attingenda quae Graeci τῆς ἐγκυκλίου παιδείας vocant; et tamen ignota aut incerta ingeniis facta, alia vero ita[1] multis prodita
15 ut in fastidium sint adducta. res ardua vetustis novitatem dare, novis auctoritatem, obsoletis nitorem, obscuris lucem, fastiditis gratiam, dubiis fidem, omnibus vero naturam et naturae sua[2] omnia. itaque nobis etiam non assecutis voluisse abunde pulchrum atque magnificum est.

16 Equidem ita sentio, peculiarem in studiis causam eorum esse qui difficultatibus victis utilitatem iuvandi praetulerunt gratiae placendi; idque iam et in aliis operibus ipse feci, et profiteor mirari T. Livium, auctorem celeberrimum, in historiarum suarum quas repetit ab origine urbis quodam volumine sic orsum: satis iam sibi gloriae quaesitum, et potuisse se desidere, ni animus inquies[3] pasceretur opere. profecto enim populi gentium victoris et Romani nominis gloriae, non suae, conposuisse illa decuit; maius meritum esset operis amore, non animi causa, per-

[1] ita a? *Rackham*. [2] *Durand*: suae. [3] *v.l.* in quiete.

[a] Now lost.
[b] A variant gives 'my mind in a period of rest.'

us who has made the same venture, nor yet one among the Greeks who has tackled single-handed all departments of the subject. A large part of us seek agreeable fields of study, while topics of immeasurable abstruseness treated by others are drowned in the shadowy darkness of the theme. Deserving of treatment before all things are the subjects included by the Greeks under the name of 'Encyclic Culture'; and nevertheless they are unknown, or have been obscured by subleties, whereas other subjects have been published so widely that they have become stale. It is a difficult task to give novelty to what is old, authority to what is new, brilliance to the common-place, light to the obscure, attraction to the stale, credibility to the doubtful, but nature to all things and all her properties to nature. Accordingly, even if we have not succeeded, it is honourable and glorious in the fullest measure to have resolved on the attempt.

For my own part I am of opinion that a special place in learning belongs to those who have preferred the useful service of overcoming difficulties to the popularity of giving pleasure; and I have myself already done this in other works also, and I declare that I admire the famous writer Livy when he begins one volume[a] of his *History of Rome from the Foundation of the City* with the words 'I have already achieved enough of fame, and I might have retired to leisure, did not my restless mind[b] find its sustenance in work.' For assuredly he ought to have composed his history for the glory of the world-conquering nation and of the Roman name, not for his own; it would have been a greater merit to have persevered from love of the work, not for the sake of his own

severasse, et hoc populo Romano praestitisse, non sibi.
17 viginti milia rerum dignarum cura—quoniam, ut ait Domitius Piso, thesauros oportet esse, non libros—lectione voluminum circiter duorum milium, quorum pauca admodum studiosi attingunt propter secretum materiae, ex exquisitis auctoribus centum inclusimus triginta sex voluminibus, adiectis rebus plurimis quas aut ignoraverant priores aut postea invenerat vita.
18 nec dubitamus multa esse quae et nos praeterierint; homines enim sumus et occupati officiis, subsicivisque temporibus ista curamus, id est nocturnis, ne quis vestrum putet his cessatum horis. dies vobis inpendimus, cum somno valetudinem conputamus, vel hoc solo praemio contenti quod, dum ista (ut ait M. Varro) muginamur,[1] pluribus horis vivimus:
19 profecto enim vita vigilia est. quibus de causis atque difficultatibus nihil auso promittere hoc ipsum tu praestas quod ad te scribimus. haec fiducia operis, haec est indicatura: multa valde pretiosa ideo videntur quia sunt templis dicata.

20 Vos quidem omnes, patrem, te fratremque, diximus opere iusto, temporum nostrorum historiam orsi a fine Aufidii.[2] ubi sit ea quaeres? iam pridem peracta sancitur; et alioqui statutum erat heredi

[1] *v.l.* musinamur.
[2] *Mayhoff* (Aufidii Bassi *codd. det.*): aut fidei *aut* aut fide *codd.*

peace of mind, and to have rendered this service to the Roman nation and not to himself. As Domitus Piso says, it is not books but store-houses that are needed; consequently by perusing about 2000 volumes, very few of which, owing to the abstruseness of their contents, are ever handled by students, we have collected in 36 volumes 20,000 noteworthy facts obtained from one hundred authors that we have explored, with a great number of other facts in addition that were either ignored by our predecessors or have been discovered by subsequent experience. Nor do we doubt that there are many things that have escaped us also; for we are but human, and beset with duties, and we pursue this sort of interest in our spare moments, that is at night—lest any of your house should think that the night hours have been given to idleness. The days we devote to you, and we keep our account with sleep in terms of health, content even with this reward alone, that, while we are dallying (in Varro's phrase) with these trifles, we are adding hours to our life—since of a certainty to be alive means to be awake. Because of these reasons and these difficulties I dare make no promise; the very words I am writing to you are supplied by yourself. This guarantees my work, and this rates its value; many objects are deemed extremely precious just because of the fact that they are votive offerings.

As for your sire, your brother and yourself, we have dealt with you all in a regular book, the *History of our own Times*, that begins where Aufidius's history leaves off. Where is this work? you will enquire. The draft has long been finished and in safe keeping; and in any case it was my resolve to entrust it to my

mandare, ne quid ambitioni dedisse vita iudi-
caretur: proinde occupantibus locum faveo, ego
vero et posteris quos scio nobiscum decertaturos
21 sicut ipsi fecimus cum prioribus. argumentum huius
stomachi mei habebis quod his [1] voluminibus auctor-
um nomina praetexui. est enim benignum (ut
arbitror) et plenum ingenui pudoris fateri per quos
profeceris, non ut plerique ex his quos attigi fecerunt.
22 scito enim conferentem auctores me deprehendisse a
iuratissimis et proximis veteres transcriptos ad
verbum neque nominatos, non illa Vergiliana virtute,
ut certarent, non Tulliana simplicitate, qui de re
publica Platonis se comitem profitetur, in consolatione
filiae 'Crantorem,' inquit, 'sequor,' item Panaetium
de officiis, quae volumina ediscenda, non modo in
23 manibus cotidie habenda nosti. obnoxii profecto
animi et infelicis ingenii est deprehendi in furto
malle quam mutuum reddere, cum praesertim sors
fiat ex usura.

24 Inscriptionis apud Graecos mira felicitas: *κηρίον*
inscripsere, quod volebant intellegi favom, alii
κέρας Ἀμαλθείας, quod copiae cornu (ut vel lactis
gallinacei sperare possis in volumine haustum),
iam *ἴα, Μοῦσαι, πανδέκται, ἐγχειρίδια, λειμών, πίναξ,
σχέδιον*—inscriptiones propter quas vadimonium de-

[1] *Rackham*: in his *codd.*

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[a] In Book I: cf. xviii. 212, auctores quos praetexuimus volumini huic.

[b] Ὀρνίθων γάλα, a proverbial rarity like pigeon's milk.

heir, to prevent its being thought that my lifetime bestowed anything on ambition: accordingly I do a good turn to those who seize the vacant position, and indeed also to future generations, who I know will challenge us to battle as we ourselves have challenged our predecessors. You will deem it a proof of this pride of mine that I have prefaced [a] these volumes with the names of my authorities. I have done so because it is, in my opinion, a pleasant thing and one that shows an honourable modesty, to own up to those who were the means of one's achievements, not to do as most of the authors to whom I have referred did. For you must know that when collating authorities I have found that the most professedly reliable and modern writers have copied the old authors word for word, without acknowledgement, not in that valorous spirit of Virgil, for the purpose of rivalry, nor with the candour of Cicero who in his *Republic* declares himself a companion of Plato, and in his *Consolation* to his daughter says 'I follow Crantor,' and similarly as to Panaetius in his *De Officiis*—volumes that you know to be worth having in one's hands every day, nay even learning by heart. Surely it marks a mean spirit and an unfortunate disposition to prefer being detected in a theft to repaying a loan—especially as interest creates capital.

There is a marvellous neatness in the titles given to books among the Greeks. One they entitled Κηρίον, meaning *Honeycomb*; others called their work Κέρας Ἀμαλθείας, i.e. *Horn of Plenty* (so that you can hope to find a draught of hen's milk [b] in the volume), and again *Violets*, *Muses*, *Hold-alls*, *Handbooks*, *Meadow*, *Tablet*, *Impromptu*—titles that might

seri possit. at cum intraveris, di deaeque, quam nihil in medio invenies! nostri graviores[1] Antiquitatum, Exemplorum Artiumque, facetissimi Lucubrationum, puto quia Bibaculus erat et vocabatur. paulo minus adserit Varro in satiris suis Sesculixe
25 et Flextabula. apud Graecos desiit nugari Diodorus et βιβλιοθήκης historiam suam inscripsit. Apion quidem grammaticus (hic quem Tiberius Caesar cymbalum mundi vocabat, quom propriae famae tympanum potius videri posset) immortalitate do-
26 nari a se scripsit ad quos aliqua componebat. me non paenitet nullum festiviorem excogitasse titulum. et ne in totum videar Graecos insectari, ex illis nos velim intellegi pingendi fingendique conditoribus quos in libellis his invenies absoluta opera, et illa quoque quae mirando non satiamur, pendenti titulo inscripsisse, ut *Apelles faciebat* aut *Polyclitus*, tamquam inchoata semper arte et inperfecta, ut contra iudiciorum varietates superesset artifici regressus ad veniam, velut emendaturo quicquid de-
27 sideraretur si non esset interceptus. quare plenum verecundiae illud est quod omnia opera tamquam novissima inscripsere et tamquam singulis fato adempti. tria non amplius, ut opinor, absolute

[1] *v.l.* crassiores.

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[a] I.e. forget an important engagement in order to read the book.

[b] We should say 'to blow his own trumpet.' Diodorus Siculus in the time of Augustus, wrote a universal history, part of which is still extant.

tempt a man to forfeit his bail.[a] But when you get inside them, good heavens, what a void you will find between the covers! Our authors being more serious use the titles *Antiquities, Instances and Systems*, the wittiest, *Talks by Lamplight*, I suppose because the author was a toper—indeed Tippler was his name. Varro makes a rather smaller claim in his Satires *A Ulysses-and-a-half* and *Folding-tablet*. Diodorus among the Greeks stopped playing with words and gave his history the title of *Library*. Indeed the philologist Apion (the person whom Tiberius Caesar used to call 'the world's cymbal,' though he might rather have been thought to be a drum,[b] advertising his own renown) wrote that persons to whom he dedicated his compositions received from him the gift of immortality. For myself, I am not ashamed of not having invented any livelier title. And so as not to seem a downright adversary of the Greeks, I should like to be accepted on the lines of those founders of painting and sculpture who, as you will find in these volumes, used to inscribe their finished works, even the masterpieces which we can never be tired of admiring, with a provisional title such as *Worked on by Apelles* or *Polyclitus*, as though art was always a thing in process and not completed, so that when faced by the vagaries of criticism the artist might have left him a line of retreat to indulgence, by implying that he intended, if not interrupted, to correct any defect noted. Hence it is exceedingly modest of them to have inscribed all their works in a manner suggesting that they were their latest, and as though they had been snatched away from each of them by fate. Not more than three, I fancy, are recorded as having an inscription denoting

traduntur inscripta; *Ille fecit* (quae suis locis reddam); quo apparuit summam artis securitatem auctori placuisse, et ob id magna invidia fuere omnia ea.

28 Ego plane meis adici posse multa confiteor, nec his solis, sed et omnibus quos edidi, ut obiter caveam istos Homeromastigas (ita enim verius dixerim), quoniam audio et Stoicos et dialecticos, Epicureos quoque (nam de grammaticis semper expectavi) parturire adversus libellos quos de grammatica edidi, et subinde abortus facere iam decem annis, cum
29 celerius etiam elephanti pariant. ceu vero nesciam adversus Theophrastum, hominem in eloquentia tantum ut nomen divinum inde invenerit, scripsisse etiam feminam, et proverbium inde natum suspendio
30 arborem eligendi! non queo mihi temperare quo minus ad hoc pertinentia ipsa censorii Catonis verba ponam, ut appareat etiam Catoni de militari disciplina commentanti, qui sub Africano, immo vero et sub Hannibale didicisset militare et ne Africanum quidem ferre potuisset, qui imperator triumphum reportasset, paratos fuisse istos qui obtrectatione alienae scientiae famam sibi aucupantur. 'Quid enim'? ait in eo volumine, 'scio ego, quae scripta sunt si palam proferantur, multos fore qui vitilitigent, sed ii potissimum qui verae laudis expertes sunt.

completion—*Made by* so-and-so (these I will bring in at their proper places); this made the artist appear to have assumed a supreme confidence in his art, and consequently all these works were very unpopular.

For my own part I frankly confess that my works would admit of a great deal of amplification, and not only those now in question but also all my publications, so that in passing I may insure myself against your 'Scourges of Homer' (that would be the more correct term), as I am informed that both the Stoics and the Academy, and also the Epicureans,—as for the philologists, I always expected it from them—are in travail with a reply to my publications on Philology, and for the last ten years have been having a series of miscarriages—for not even elephants take so long to bring their offspring to birth! But as if I didn't know that Theophrastus, a mortal whose eminence as an orator won him the title of 'the divine,' actually had a book written against him by a woman—which was the origin of the proverb about 'choosing your tree to hang from'! I am unable to refrain from quoting the actual words of Cato the Censor applying to this, to show that even the treatise on military discipline of Cato, who had learnt his soldiering under Africanus, or rather under him and Hannibal as well, and had been unable to endure even Africanus, who when commander-in-chief had won a triumph, found critics ready for it of the sort that try to get glory for themselves by running down another man's knowledge. 'What then?' he says in the book in question, 'I myself know that if certain writings are published there will be plenty of people to quibble and quarrel, but mostly people quite devoid of true distinction. For

31 eorum ego orationes sivi praeterfluere.' nec Plancus inlepide, cum diceretur Asinius Pollio orationes in eum parare quae ab ipso aut liberis post mortem Planci ederentur, ne respondere posset, 'cum mortuis non nisi larvas luctari.' quo dicto sic repercussit illas,
32 ut apud eruditos nihil impudentius iudicetur. ergo securi etiam contra vitilitigatores (quos Cato eleganter ex vitiis et litigatoribus conposuit, quid enim illi aliud quam litigant aut litem quaerunt?) exequemur
33 reliqua propositi. quia occupationibus tuis publico bono parcendum erat, quid singulis contineretur libris huic epistulae subiunxi, summaque cura ne legendos eos haberes operam dedi. tu per hoc et aliis praestabis ne perlegant, sed ut quisque desiderabit aliquid id tantum quaerat, et sciat quo loco inveniat. hoc ante me fecit in litteris nostris Valerius Soranus in libris quos ἐποπτίδων inscripsit.

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[a] Perhaps this title for a work of scholarship denoted the inner secrets of learning into which it admitted the Muses. Soranus fl. 100 B.C.

my part I have let these persons' eloquence run its course.' Plancus also put it neatly, when told that Asinius Pollio was composing declamations against him, to be published by himself or his children after Plancus's death, so that he might be unable to reply: 'Only phantoms fight with the dead!' This remark dealt those declamations such a nasty blow that in cultivated circles they are thought the most shameless things extant. Accordingly, being safeguarded even against quibble-quarrellers (Cato's nickname for them—a neat compound word, for what else do these people do but quarrel or seek a quarrel?) we will follow out the remainder of our intended plan. As it was my duty in the public interest to have consideration for the claims upon your time, I have appended to this letter a table of contents of the several books, and have taken very careful precautions to prevent your having to read them. You by these means will secure for others that they will not need to read right through them either, but only look for the particular point that each of them wants, and will know where to find it. This plan has been adopted previously in Roman literature, by Valerius Soranus in his books entitled *Lady Initiates*.[a]

BOOK I

LIBER I

Libro II. continentur: (i–iii) An finitus sit mundus et an unus. de forma eius. de motu eius. cur mundus dicatur. (iv) De elementis. (v) De deo. (vi) De siderum errantium natura. (vii) de lunae et solis defectibus. de nocte. (viii–x) de magnitudine siderum. quae quis invenerit in observatione caelesti. (xi) de lunae motu. (xii–xvi) Errantium motus et luminum canonica; quare eadem altiora alias, alias [1] propiora videantur; catholica siderum errantium; quae ratio colores eorum mutet. (xvii) solis motus; dierum inaequalitatis ratio. (xviii) Quare fulmina Iovi adsignentur. (xix) Intervalla siderum. (xx) de sideribus musica. (xxi) de mundo geometrica. (xxii, xxiii) De repentinis sideribus. de cometis: natura et situs et genera eorum. (xxiv) Hipparchea de sideribus agnoscendis. (xxv–xxxv) De caelestibus prodigiis per exempla historica: lampades, bolides, trabes caelestes, chasma caeli; de caeli coloribus; de flamma caelesti; de coronis caelestibus; de circulis repentinis; solis defectus longiores; plures soles; plures lunae; diurna [2] noctibus lux; clipei ardentes; ostentum caeli semel notatum. (xxxvi) De discursu stellarum. (xxxvii) De stellis quae Castores vocantur. (xxxviii) De aere. (xxxix–xli) De statis tempestatibus. de caniculae

[1] alias *add. Jan.*

BOOK I

Table of Contents and Authorities

Book II. Contents: (i–iii) The world—is it finite? is it one? its shape; its motion; reason for its name. (iv) The elements. (v) God. (vi) The planets—their nature. (vii) Eclipses, solar and lunar. Night. (viii–x) The stars—their magnitude; astronomical discoveries. (xi) The moon's motion. (xii–xvi). Motions of the planets; theory of their light; causes of apparent recession and approach; general properties of planets; reason for changes of colour. (xvii) The sun's motion; reason for inequality of days. (xviii) Thunderbolts, why attributed to Jove. (xix) The stars—their distances apart. (xx) Music from the stars. (xxi) Dimensions of the world. (xxii, xxiii) Shooting stars. Comets; their nature, position and kinds. (xxiv) Identification of stars—method of Hipparchus. (xxv–xxxv) Sky portents—recorded instances: torches, shafts, sky-beams, sky-yawning, colours of the sky, sky-flame, sky-wreaths, sudden rings, prolonged solar eclipses, several suns, several moons, daylight at night, burning shield; an unique sky-portent. (xxxvi) Disruption of stars. (xxxvii) The 'Castores.' (xxxviii) The air. (xxxix–xli). Fixed seasons. Rise of dog-

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[1] diurna *Detlefsen*: dierum (dierum⟨modo⟩ *Mayhoff*).

ortu. vis temporum anni stata. (xlii, iii) De incertis tempestatibus. de imbribus et quare lapidibus pluat. de tonitribus et fulgetris. (xliv–viii) Qua ratione echo reddatur. Ventorum genera, naturae, observationes. (xlix, l) Ecnephias, typhon, turbines, presteres, vertices, alia prodigiosa genera tempestatum. (li–lvi) De fulminibus, quibus in terris non cadant, et quare; genera fulgurum et miracula; Etrusca observatio in iis et Romana; de fulminibus evocandis; catholica fulgurum; quae numquam feriantur. (lvii) Lacte pluisse, sanguine, carne, ferro, lana, lateribus coctis. (lviii) Portenta. (lix) De lapidibus caelo cadentibus. Anaxagorea de his. (lx) Arcus caelestis. (lxi) Natura grandinis, nivis, pruinae, nebulae, roris. Nubium imagines. (lxii) Proprietates caeli in locis. (lxiii–v) Natura terrae; de forma eius; an sint antipodes. (lxvi–viii) Quomodo aqua terrae innexa. quae ratio fluminum. an circumdatus terrae oceanus. quae portio terrae habitetur. (lxix) Mediam esse mundi terram. (lxx f.) De obliquitate zonarum. de inaequalitate climatum. (lxxii f.) Ubi eclipsis non appareant, et quare. Quae ratio diurnae lucis in terris; gnomonica de ea re. (lxxv, vii) Ubi et quando nullae umbrae, ubi bis anno. ubi in contrarium umbrae ferantur. Ubi longissimi dies, ubi brevissimi. (lxxviii) De primo horologio. (lxxix) Quomodo observentur dies. (lxxx) Differentia gentium ad rationem mundi. (lxxxi–vi) De terrae motibus. de terrae hiatibus. signa motus futuri. auxilia contra motus futuros. portenta terrarum semel tradita. miracula terrae motus. (lxxxvii–xciv) Quibus locis maria recesserint. Insularum enascentium ratio; quae et quibus temporibus enatae sint. quas terras interruperint

star. Regular effect of seasons. (xlii, iii) Irregular seasons. Rain storms. Showers of stones, their reason. Thunder-bolts and lightnings. (xliv–viii) Echo—its reason. Winds—their kinds, natures and behaviour. (xlix, l). Cloud-burst, typhoon, whirlwinds, *presteres*, tornadoes, other portentous kinds of storms. (li–vi) Thunder-bolts—what countries immune from them and why; their kinds, their peculiarities; Tuscan and Roman observances connected with; method of calling down; general properties; what objects never struck. (lvii) Showers of milk, blood, flesh, iron, wool, bricks. (lviii) Portents. (lix) Stones falling from the sky—Anaxagoras as to. (lx) Rainbow. (lxi). Nature of hail, snow, frost, cloud, dew. (lxii) Local peculiarities of the sky. (lxiii–v) Nature of the earth; its shape; antipodes—do they exist? (lxvi–viii) Water—how linked with earth? Rivers—their reason. Is the earth surrounded by the ocean? What portion of the earth is inhabited? (lxix). The earth at the centre of the world. (lxx) Obliquity of zones. Inequality of climates. (lxxii) Eclipses—where invisible, and why? (lxxiii) Reason for daylight on earth; gnomonics of daylight. (lxxv–vii). Absence of shadows—where and when? where twice yearly? where shadows travel in opposite direction? Where days are longest and shortest? (lxxviii) The first clock. (lxxix) How days are observed. (lxxx) Racial difference and latitude. (lxxxi–vi) Earthquakes. Chasms. Signs of impending earthquake. Precautions against impending earthquakes. Records of unique earth portents. Marvels of earthquake. (lxxxvii–xciv) Retreat of sea, where occurred? Emergence of islands—reason for; instances and dates of. Dis-

maria. quae insulae continenti adiunctae sint. quae terrae in totum mari permutatae. quae terrae ipsae se minuerint. urbes haustae mari. (xcv) De spiraculis. (xcvi) De terris semper trementibus. de insulis semper fluctuantibus. (xcvii) Quibus locis non impluat. (xcviii) Acervata terrarum miracula. (xcix f.) Qua ratione aestus maris accedant et recedant. ubi aestus extra rationem idem faciant. (ci–cv) Miracula maris: quae potentia lunae ad terrena et marina, quae solis. quare salsum mare. ubi altissimum mare. (cvi) Mirabilia fontium et fluminum. (cvii–cx) Ignium et aquarum iuncta miracula: de maltha; de naphtha; quae loca semper ardeant. (cxi) Ignium per se miracula. (cxii) Terrae universae mensura. (cxiii) Harmonica mundi ratio. Summa: res et historiae et observationes CCCCXVII.

Ex auctoribus: M. Varrone, Sulpicio Gallo, Tito Caesare imperatore, Q. Tuberone, Tullio Tirone, L. Pisone, T. Livio, Cornelio Nepote, Seboso, Caelio Antipatro, Fabiano, Antiate, Muciano, Caecina qui de Etrusca disciplina, Tarquitio qui item, Iulio Aquila qui item, Sergio Paullo. Externis: Hipparcho, Timaeo, Sosigene, Petosiri, Nechepso Pythagoricis, Posidonio, Anaximandro, Epigene, Eudoxo, Democrito, Critodemo, Thrasyllo, Serapione gnomonico, Euclide, Coerano philosopho, Dicaearcho, Archimede, Onesicrito, Eratosthene, Pythea, Herodoto, Aristotele, Ctesia, Artemidoro Ephesio, Isidoro Characeno, Theopompo.

Libro III. continentur situs, gentes, maria, oppida, portus, montes, flumina, mensurae, populi qui sunt aut qui fuerunt (iii) Baeticae, (iv) Hispaniae citerioris, (v) Narbonensis provinciae, (vi–x) Italiae usque

ruption of straits. Junction of islands with mainland. Total inundation. Shrinkage of land areas. Cities engulfed by sea. (xcv) Air-holes. (xcvi) Continuous earth-tremors. Islands in constant agitation. (xcvii) Places where rain does not fall. (xcviii) Collection of earth marvels. (xcix f.) Rise and fall of tides—reason for. Where do irregular tides occur? (ci–cv) Marvels of the sea: influence of the moon on earth and sea; of the sun; why is the sea salt? where is it deepest? (cvi) Remarkable properties of springs and rivers. (cvii–cx) Combined marvels of fire and water: mineral pitch; naphtha; regions constantly glowing. (cxi) Marvels of fire alone. (cxii) Dimensions of entire earth. (cxiii) Harmonic principle of the world.—Total: 417 facts, investigations and observations.

Authorities: Marcus Varro, Sulpicius Gallus, the Emperor Titus Caesar, Quintus Tubero, Tullius Tiro, Lucius Piso, Titus Livy, Cornelius Nepos, Sebosus, Caelius Antipater, Fabianus, Antias, Mucianus, Caecina *On the Tuscan System*, Tarquitius *ditto*, Julius Aquila *ditto*, Sergius Paullus. Foreign authorities; the Pythagorean writers, Hipparchus, Timaeus, Sosigenes, Petosiris, Nechepsus, Posidonius, Anaximander, Epigenes, Eudoxus, Democritus, Critodemus, Thrasyllus, Serapion *On Sun-dials*, Euclid, Coeranus the philosopher, Dicaearchus, Archimedes, Onesicritus, Eratosthenes, Pytheas, Herodotus, Aristotle, Ctesias, Artemidorus of Ephesus, Isidore of Charax, Theopompus.

Book III. Contents: sites, races, seas, towns, harbours, mountains, rivers, dimensions, present and past populations of (iii) Baetica, (iv) North-east Spain, (v) Province of Narbonne, (vi–x) Italy to the

Locros (ix Tiberis, Roma), (xi–xiv) insularum LXIV (in his Baliarium, Corsicae, Sardiniae, Siciliae), (xv–xxii) Italiae a Locris usque Ravennam; (de Pado), Italiae trans Padum, (xxiii) Histriae, (xxiv) Alpium et gentium Alpinarum, (xxv–xxx) Illyrici, Liburniae, Dalmatiae, Noricorum, Pannoniae, Moesiae, insularum Ionii et Hadriatici. Summa: oppida et gentes . . . Summa: flumina clara . . . Summa: montes clari . . . Summa: insulae . . . Summa: quae intercidere oppida aut gentes . . . Summa: res et historiae et observationes. . . .

Ex auctoribus: Turranio Gracile, Cornelio Nepote, T. Livio, Catone censorio, M. Agrippa, M. Varrone, divo Augusto, Varrone Atacino, Antiate, Hygino, L. Vetere, Pomponio Mela, Curione patre, Caelio, Arruntio, Seboso, Licinio Muciano, Fabricio Tusco, L. Ateio, Ateio Capitone, Verrio Flacco, L. Pisone, Gelliano, Valeriano. Externis: Artemidoro, Alexandro Polyhistore, Thucydide, Theophrasto, Isidoro, Theopompo, Metrodoro Scepsio, Callicrate, Xenophonte Lampsaceno, Diodoro Syracusano, Nymphodoro, Calliphane, Timagene.

Libro IV. continentur situs, gentes, maria, oppida, portus, montes, flumina, mensurae, populi qui sunt aut qui fuerunt (i–iv) Epiri, (v–x) Achaiae, (xi–xiii) Graeciae, (xiv–xviii) Thessaliae, Magnesiae, Macedoniae, Thraciae, (xix–xxiii) insularum ante eas terras (inter quas, Creta, Euboea, Cyclades, Sporades), (xxiv) Hellesponti, Ponti, Maeotidis, (xxv f.) Daciae, Sarmatiae, Scythiae, (xxvii) insularum Ponti, (xxviii f.) Germaniae, (xxx) insularum in Gallico oceano XCVI, quas inter Britannia, (xxxi–iii) Belgicae Galliae, Lugdunensis Galliae, Aquitanicae Galliae, (xxxiv) citerioris Hispaniae ab oceano,

southernmost point, (ix the Tiber, Rome), (xi–xiv) 64 islands (including the Balearics, Corsica, Sardinia, Sicily), (xv–xxii) Italy from the south to Ravenna (the Po), Transpadane Italy, (xxiii) Istria, (xxiv) the Alps and Alpine races, (xxv–xxx) Illyria, Liburnia, Dalmatia, Noricum, Pannonia, Moesia, Ionian and Adriatic islands. Totals: [a] . . . famous rivers; . . . famous mountains; . . . islands; . . . extinct towns or races; . . . facts, researches and observations.

Authorities: Turanius Gracilis, Cornelius Nepos, Livy, Cato the Censor, Marcus Agrippa, Marcus Varro, His Late Majesty Augustus, Varro of Atax, Antias, Hyginus, Lucius Vetus, Pomponius Mela, the elder Curio, Caelius, Arruntius, Sebosus, Licinius Mucianus, Fabricius Tuscus, Lucius Ateius, Ateius Capito, Verrius Flaccus, Lucius Piso, Gellianus, Valerian. Foreign authorities: Artemidorus, Alexander the Learned, Thucydides, Theophrastus, Isidorus, Theopompus, Metrodorus of Scepsis, Callicrates, Xenophon of Lampsacus, Diodorus of Syracuse, Nymphodorus, Calliphanes, Timagenes.

Book IV. Contents: sites, races, seas, towns, harbours, mountains, rivers, dimensions, present and past populations of (i–iv) Epirus, (v–x) Achaïa, (xi–xiii) Greece, (xiv–xviii) Thessaly, Magnesia, Macedonia, Thrace, (xix–xxiii) islands off these coasts, including Crete, Euboea, the Cyclades, the Sporades, (xxiv) Dardanelles, Black Sea, Sea of Azov, (xxv f.) Dacia, Sarmatia, Scythia, (xxvii) Islands of Black Sea, (xxviii f.) Germany, (xxx) North Sea islands, 96 including Britain, (xxxi–xxxiii) Belgium, Lyonnaise, Aquitaine, (xxxiv) North-eastern Spain,

[a] Figures lost here.

(xxxv) Lusitaniae, (xxxvi) insularum in mari Atlantico. (xxxvii) Universae Europae mensura. Summa: oppida et gentes . . . Summa: flumina clara . . . Summa: montium clari . . . Summa: insulae . . . Summa: quae intercidere oppida aut gentes . . . Summa: res, historiae et observationes . . .

Ex auctoribus: Catone censorio, M. Varrone, M. Agrippa, divo Augusto, Varrone Atacino, Cornelio Nepote, Hygino, L. Vetere, Mela Pomponio, Licinio Muciano, Fabricio Tusco, Ateio Capitone, Ateio philologo. Externis: Polybio, Hecataeo, Hellanico, Damaste, Eudoxo, Dicaearcho, Timosthene, Eratosthene, Ephoro, Cratete grammatico, Serapione Antiochense, Callimacho, Artemidoro, Apollodoro, Agathocle, Timaeo Siculo, Myrsilo, Alexandro Polyhistore, Thucydide, Dosiade, Anaximandro, Philistide Mallote, Dionysio, Aristide, Callidemo, Menaechmo, Aglaosthene, Anticlide, Heraclide, Philemone, Xenophonte, Pythea, Isidoro, Philonide, Xenagora, Astynomo, Staphylo, Aristocrito, Metrodoro, Cleobulo, Posidonio.

Libro V. continentur situs, gentes, maria, oppida, portus, montes, flumina, mensurae, populi qui sunt aut qui fuerunt (i–viii) Mauritaniarum, Numidiae, Africae, Syrtium, Cyrenaicae, insularum circa Africam, aversorum Africae, (ix–xi) Aegypti, Chorae, Thebaidis, Nili, (xii) Arabiae quae est ad mare Aegyptium, (xiii–xix) Idumaeae, Syriae, Palaestines, Samariae, Iudaeae, Phoenices, Syriae Coeles, Syriae Antiochiae, (xx–xxxiii) Euphratis, Ciliciae et iunctarum gentium, Isauricae, Omanadum, Pisidiae, Lycaoniae, Pamphyliae, Tauri montis, Lyciae, Cariae, Ioniae, Aeolidis, Troadis et iunctarum gentium, (xxxiv–ix) insularum ante Asiam CCXII (in iis. Cypri,

(xxxv) Western Spain and Portugal. (xxxvi) Atlantic islands. (xxxvii) Dimensions of the whole of Europe. —Totals: . . . towns and races; . . . famous rivers; . . . famous mountains; . . . islands; . . . extinct towns or races; . . . facts, investigations and observations.

Authorities: Cato the Censor, Marcus Varro, Marcus Agrippa, His Late Majesty Augustus, Varro of Atax, Cornelius Nepos, Hyginus, Lucius Vetus, Pomponius Mela, Licinius Mucianus, Fabricius Tuscus, Ateius Capito, Ateius the scholar. Foreign authorities: Polybius, Hecataeus, Hellanicus, Damastes, Eudoxus, Dicaearchus, Timosthenes, Eratosthenes, Ephorus, Crates the philologist, Serapion of Antioch, Callimachus, Artemidorus, Apollodorus, Agathocles, Timaeus of Sicily, Myrsilus, Alexander the Learned, Thucydides, Dosiades, Anaximander, Philistides of Mallus, Dionysius, Aristides, Callidemus, Menaechmus, Aglaosthenes, Anticlides, Heraclides, Philemon, Xenophon, Pytheas, Isidore, Philonides, Xenagoras, Astynomos, Staphylus, Aristocritus, Metrodorus, Cleobulus, Posidonius.

Book V. Contents:—sites, races, seas, towns, harbours, mountains, rivers, dimensions, present and past populations of (i–viii) the Mauritanias, Numidia, Africa, the Syrtes, Cyrenaica, African islands, remote parts of Africa, (ix–xi) Egypt—Chora, Thebaid, Nile, (xii) Arabian coast of Egyptian Sea, (xiii–xix) Idumea, Syria, Palestine, Samaria, Judaea, Phoenicia, Hollow Syria, Syria of Antioch, (xx–xxxiii) Euphrates, Cilicia and adjoining races, Isaurica, Omanades, Pisidia, Lycaonia, Pamphylia, Taurus Mountain, Lycia, Caria, Ionia, Aeolid, Troad and adjoining races, (xxxiv-ix) Islands on Asiatic coast (212)

Rhodi, Coi, Sami, Chii, Lesbi), (xl-xliii) Hellespontus, Mysia, Phrygia, Galatia et iunctae gentes, Bithynia. Summa: oppida et gentes . . . Summa: flumina clara . . . Summa: montium clari . . . Summa: insulae CXVIII. Summa: quae intercidere oppida aut gentes . . . Summa: res et historiae et observationes . . .

Ex auctoribus: Agrippa, Suetonio Paulino, M. Varrone, Varrone Atacino, Cornelio Nepote, Hygino, L. Vetere, Mela, Domitio Corbulone, Licinio Muciano, Claudio Caesare, Arruntio, Livio filio, Seboso, actis triumphorum. Externis: Iuba rege, Hecataeo, Hellanico, Damaste, Dicaearcho, Baetone, Timosthene, Philonide, Xenagora, Astynomo, Staphylo, Dionysio, Aristotele, Aristocrito, Ephoro, Eratosthene, Hipparcho, Panaetio, Serapione Antiocheno, Callimacho, Agathocle, Polybio, Timaeo mathematico, Herodoto, Myrsilo, Alexandro polyhistore, Metrodoro, Posidonio qui περίπλουν aut περιήγησιν, Sotade, Pindaro, Aristarcho Sicyonio, Eudoxo, Antigene, Callicrate, Xenophonte Lampsaceno, Diodoro Syracusano, Hannone, Himilcone, Nymphodoro, Calliphane, Artemidoro, Megasthene, Isidoro, Cleobulo, Aristocreonte.

Libro VI. continentur situs, gentes, maria, oppida, portus, montes, flumina, mensurae, populi qui sunt aut qui fuerunt (i) Ponti, Mariandynorum, (ii) Paphlagonum, (iii, viii) Cappadocum. (iv) Themiscyrena regio et in ea gentes, Heniochi, (v) regio Colica et gentes, Achaeorum gentes, ceterae eodem tractu gentes, (vi–xii) Bosporus Cimmerius, Maeotis, gentes circa Maeotim, Armenia minor, Armenia maior, Cyrus fluvius, Araxes fluvius, Albania, Iberia et iunctae portae Caucasiae, (xiii) insulae in Ponto,

including Cyprus, Rhodes, Cos, Samos, Chios, Lesbos, (xl–xliii) Dardanelles, Mysia, Phrygia, Galatia and adjoining races, Bithynia. Totals: . . . towns and races; . . . famous rivers; . . . famous mountains; 118 islands; . . . extinct towns and races; . . . facts, investigations and observations.

Authorities: Agrippa, Suetonius Paulinus, Marcus Varro, Varro of Atax, Cornelius Nepos, Hyginus, Lucius Vetus, Mela, Domitius Corbulo, Licinius Mucianus, Claudius Caesar, Arruntius, Livy junior, Sebosus, *Triumphs—Official records.* Foreign authorities: King Juba, Hecataeus, Hellanicus, Damastes, Dicaearchus, Baeto, Timosthenes, Philonides, Xenagoras, Astynomus, Staphylus, Dionysius, Aristotle, Aristocritus, Ephorus, Eratosthenes, Hipparchus, Panaetius, Serapio of Antioch, Callimachus, Agathocles, Polybius, Timaeus the mathematician, Herodotus, Myrsilus, Alexander the Learned, Metrodorus, Posidonius's *Circumnavigation* or *Round Guide*, Sotades, Pindar, Aristarchus of Sicyon, Eudoxus, Antigenes, Callicrates, Xenophon of Lampsacus, Diodorus of Syracuse, Hanno, Himilco, Nymphodorus, Calliphanes, Artemidorus, Megasthenes, Isidore, Cleobulus, Aristocreon.

Book VI. Contents:—sites, races, seas, towns, harbours, mountains, rivers, dimensions, present and past populations of (i) Pontus, Mariandyni, (ii) Paphlagonia, (iii, viii) Cappadocia, (iv) region of Themiscyra and its races, Heniochi, (v) Colic region and races, Achaean races, other races in the same area, (vi–xii) Cimmerian Bosphorus, Maeotis and adjacent races, Lesser Armenia, Greater Armenia, River Cyrus, River Araxes, Albania, Iberia and adjoining Gates of Caucasia, (xiii) Black Sea Islands,

(xiv) gentes a Scythico oceano, (xv–xix) Caspium et Hyrcanium mare, Adiabene, Media, portae Caspiae, gentes circa Hyrcanium mare, Scytharum gentes, (xx–xxxvi) situs ab oceano Eoo, Seres, Indi (Ganges, Indus), Taprobane, Ariani et iunctae gentes, navigationes in Indiam, Carmania, sinus Persicus, Parthorum regna, Mesopotamia, Tigris, Arabia, sinus maris rubri, Trogodytice, Aethiopia, insulae Aethiopici maris. (xxxvii) De insulis fortunatis. (xxxviii f.) Terrae per mensuras conparatae, digestio terrarum in parallelos et umbras pares. Summa: oppida MCXCV. Summa: gentes DLXXVI. Summa: flumina clara CXV. Summa: montes clari XXXVIII. Summa: insulae CVIII. Summa: quae intercidere oppida aut gentes XCV. Summa: res et historiae et observationes MMCCXIV.

Ex auctoribus: M. Agrippa, M. Varrone, Varrone Atacino, Cornelio Nepote, Hygino, L. Vetere, Mela Pomponio, Domitio Corbulone, Licinio Muciano, Claudio Caesare, Arruntio, Seboso, Fabricio Tusco, T. Livio filio, Seneca, Nigidio. Externis: Iuba rege, Hecataeo, Hellanico, Damaste, Eudoxo, Dicaearcho, Baetone, Timosthene, Patrocle, Demodamante, Clitarcho, Eratosthene, Alexandro magno, Ephoro, Hipparcho, Panaetio, Callimacho, Artemidoro, Apollodoro, Agathocle, Polybio, Timaeo Siculo, Alexandro polyhistore, Isidoro, Amometo, Metrodoro, Posidonio, Onesicrito, Nearcho, Megasthene, Diogneto, Aristocreonte, Bione, Dalione, Simonide minore, Basile, Xenophonte Lampsaceno.

Libro VII. continentur (ii f.) gentium mirabiles figurae; prodigiosi partus. (iv–xi) De homine generando: pariendi tempora per inlustria exempla

(xiv) races towards the Scythian Ocean, (xv–xix) Caspian and Hyrcanian Sea, Adiabene, Media, Caspian Gates, races round Hyrcanian Sea, Scythian races, (xx–xxxvi) regions towards the Eastern Sea, China, India (Ganges, Indus), Taprobane, Arians and adjoining races, voyages to India, Carmania, Persian Gulf, Parthian kingdoms, Mesopotamia, Tigris, Arabia, Gulf of Red Sea, Trogodyte country, Ethiopia, Islands of Ethiopian Sea. (xxxvii) The Fortunate Islands. (xxxviii f.) Lands compared by measurements, division of lands into parallels and equal shadows. Totals: 1195 towns; 576 races, 115 famous rivers, 38 famous mountains, 108 islands, 95 extinct towns and races; 2214 facts and investigations and observations.

Authorities: Marcus Agrippa, Marcus Varro, Varro of Atax, Cornelius Nepos, Hyginus, Lucius Vetus, Pomponius Mela, Domitius Corbulo, Licinius Mucianus, Claudius Caesar, Arruntius, Sebosus, Fabricius Tuscus, Titus Livy junior, Seneca, Nigidius. Foreign authorities: King Juba, Hecataeus, Hellanicus, Damastes, Eudoxus, Dicaearchus, Baeto, Timosthenes, Patrocles, Demodamas, Clitarchus, Eratosthenes, Alexander the Great, Ephorus, Hipparchus, Panaetius, Callimachus, Artemidorus, Apollodorus, Agathocles, Polybius, Timaeus of Sicily, Alexander the Learned, Isidore, Amometus, Metrodorus, Posidonius, Onesicritus, Nearchus, Megasthenes, Diognetus, Aristocreon, Bion, Dalion, the younger Simonides, Basilis, Xenophon of Lampsacus.

Book VII. Contents: (ii f.) Remarkable racial bodily configurations; monstrous births. (iv–xi) Human generation: periods of pregnancy from 7 months to

a mensibus septem ad tredecim; signa sexus in gravidis pertinentia ante partum; monstruosi partus, excisi utero; qui sint vopisci; de conceptu hominum; de generatione hominum; similitudinum exempla; numerosissimae subolis exempla. (xii) Ad quos annos generatio. (xiii) Mensum in feminis miracula. (xiv) Quae ratio generandi. (xv) Historica circa dentes. Historica circa infantes. (xvi f.) Magnitudinum exempla. Praepropери infantes. (xviii–xxiii) Insignia corporum, vires eximiae, velocitas praecipua, visus eximius, auditus miraculum, patientia corporis. (xxiv–vi) Memoria, vigor animi, clementia, animi magnitudo. (xxvii) Rerum gestarum claritas summa. (xxviii–xxxi) Tres summae virtutes in eodem, innocentia summa, fortitudo summa, ingenia praecipua. qui sapientissimi. (xxxii) Praecepta vitae utilissima. (xxxiii) De divinatione. (xxxiv–vi) Vir optimus iudicatus, matronae pudicissimae; summae pietatis exempla. (xxxvii–ix) Artibus excellentes—astrologia, grammatica, medicina, geometria, architectura, pictura, scalptura aeraria, marmoraria, eboraria, caelatura. (xl–xlvi) Pretia hominum insignia; de felicitate summa; raritas continuationis in familiis; varietatis exempla mirabilia; bis proscriptus; honorum exempla mirabilia; decem res in uno felicissimae; divi Augusti adversa. (xlvii f.) Quos dii felicissimos iudicaverint; quem viventem ut deum coli iusserint. Fulgur mirabile. (xlix) De spatiis vitae longissimis. (l) De varietate nascendi. (li) In morbis exempla

[a] One of a pair of twins born alive after the premature birth and death of the other.

13 shown by famous examples; significant pre-natal indications of sex in the pregnant; monstrous births, cases of surgical delivery; meaning of *vopiscus* [a]; human conception; human generation; cases of likeness; cases of very numerous progeny. (xii) Age-limit of procreation. (xiii) Exceptional periods of pregnancy. (xiv) Theory of generation. (xv) Investigation as to teeth; as to infants. (xvi f.) Instances of exceptional size. Premature births. (xviii–xxiii) Bodily distinctions, exceptional strength, remarkable speed, exceptional sight, marvellous hearing, bodily endurance. (xxiv–xxvi) Memory, mental vigour, clemency, magnanimity. (xxvii) Supremely distinguished exploits. (xxviii–xxxi) Three supreme virtues in the same person, supreme innocence, supreme bravery, exceptional talents. Who are the wisest men? (xxxii) The most useful rules of conduct. (xxxiii) Divination. (xxxiv–vi). The man deemed the best, the most chaste matrons; instances of extreme piety. (xxxvii–ix) Cases of eminence in the sciences and arts, astronomy, philology, medicine, geometry, architecture, painting, sculpture in bronze, in marble, in ivory; engraving. (xl–xlvi) Remarkable prizes of mankind; supreme happiness; rarity of its continuance in families; remarkable cases of change of fortune; twice proscribed; remarkable cases of honours; ten supremely happy things in the case of a single person; misfortunes of his late Majesty Augustus. (xlvii f.) Whom the gods have judged happiest; what man they have commanded to be worshipped as a god in his lifetime. A remarkable flash of lightning. (xlix) Cases of exceptional longevity. (l) Various modes of birth. (li) Diseases in various cases.

varia. (lii–lvi f.) De morte; qui elati revixerint; subitae mortis exempla; de sepultura; de manibus; de anima. (lvii–lx) Quae quis in vita invenerit: in quibus rebus primi gentium consensus. De antiquis litteris. Quando primum tonsores, quando primum horologia. Summa: res et historiae et observationes DCCXLVII.

Ex auctoribus: Verrio Flacco, Gnaeo Gellio, Licinio Muciano, Masurio Sabino, Agrippina Claudi, M. Cicerone, Asinio Pollione, M. Varrone, Messala Rufo, Nepote Cornelio, Vergilio, T. Livio, Cordo, Melisso, Seboso, Cornelio Celso, Maximo Valerio, Trogo, Nigidio Figulo, Pomponio Attico, Pediano Asconio, Fabiano, Catone censorio, actis, Fabio Vestale. Externis: Herodoto, Aristea, Baetone, Isigono, Cratete, Agatharchide, Calliphane, Aristotele, Nymphodoro, Apollonide, Phylarcho, Damone, Megasthene, Ctesia, Taurone, Eudoxo, Onesicrito, Clitarcho, Duride, Artemidoro, Hippocrate medico, Asclepiade medico, Hesiodo, Anacreonte, Theopompo, Hellanico, Damaste, Ephoro, Epigene, Beroso, Petosiri, Nechepso, Alexandro polyhistore, Xenophonte, Callimacho, Democrito, Diyllo historico, Stratone qui contra Ephori εὑρήματα scripsit, Heraclide Pontico, Asclepiade qui τραγῳδούμενα, Philostephano, Hegesia, Archemacho, Thucydide, Mnesigitone, Xenagora, Metrodoro Scepsio, Anticlide, Critodemo.

Libro VIII. continentur: (i–xi) De elephantis—de sensu eorum; quando primum iuncti; de docilitate eorum; mirabilia in factis eorum; de natura ferarum ad pericula sua intellegenda; quando primum in Italia visi elephanti; pugnae eorum; quibus modis

(lii–lvi) Death; cases of the dead coming to life again; instances of sudden death; burial; ghosts; the soul. (lvii–lx) Discoveries in life; matters on which there was the earliest agreement of the races; ancient literature; date of earliest barbers, earliest time-pieces. Total: 747 facts, investigations and observations.

Authorities: Verrius Flaccus, Gnaeus Gellius, Licinius Mucianus, Masurius Sabinus, Agrippina wife of Claudius, Marcus Cicero, Asinius Pollio, Marcus Varro, Messala Rufus, Cornelius Nepos, Virgil, Livy, Cordus, Melissus, Sebosus, Cornelius Celsus, Valerius Maximus, Trogus, Nigidius Figulus, Pomponius Atticus, Pedianus Asconius, Fabianus, Cato the Censor, *Official Records*, Fabius Vestalis. Foreign authorities: Herodotus, Aristeas, Baeton, Isigonus, Crates, Agatharchides, Calliphanes, Aristotle, Nymphodorus, Apollonides, Phylarchus, Damon, Megasthenes, Ctesias, Tauron, Eudoxus, Onesicritus, Clitarchus, Duris, Artemidorus, the medical authors Hippocrates and Asclepiades, Hesiod, Anacreon, Theopompus, Hellanicus, Damastes, Ephorus, Epigenes, Berosus, Petosiris, Nechepsus, Alexander the Learned, Xenophon, Callimachus, Democritus, the historian Diyllus, Strato's *Reply to Ephorus's 'Heuremata,'* Heraclides of Pontus, the *Tragoedumena* of Asclepiades, Philostephanus, Hegesias, Archemachus, Thucydides, Mnesigiton, Xenagoras, Metrodorus of Scepsis, Anticlides, Critodemus.

Book VIII. Contents: (i–xi) Elephants, their sense; when first harnessed; their docility; remarkable achievements of; instinctive sense of dangers in wild animals; elephants, when first seen in Italy; fights between elephants; modes of capture; modes

capiantur; quibus domentur; de partu eorum et reliqua natura; ubi nascantur; discordia eorum et draconum. (xii) De sollertia animalium. (xiii) De draconibus. (xiv) Mirae magnitudines serpentium. (xv f.) De Scythicis animalibus, de septentrionalibus, de bisontibus, uris, alce, achli, bonaso. (xvii–xxi) De leonibus—quomodo gignantur; quae genera eorum; quae propria naturae; quis primus leontomachiam Romae, quis plurimos in ea leones donaverit; quis primus Romanorum iunxerit; mirabilia in leonum factis. (xxii) A dracone agnitus et servatus. (xxiii f.) De pantheris senatusconsultum et leges de Africanis; quis primus Romae Africanas et quando, quis plurimas. (xxv) De tigribus et quando primum Romae visa tigris; de natura earum, de catulis. (xxvi–xxx) De camelis; genera eorum. de camelopardali; quando primum Romae visa. de chamate. de cephis, de rhinocerote. de lynce et sphingibus. de crocottis. de cercopithecis. (xxxi–iv) Indiae terrestria animalia; item Aethiopiae; bestia visu interficiens; de basiliscis serpentibus; de lupis; unde fabula versipellium. (xxxv–xl) Serpentium genera. de ichneumone; de crocodilo; de scinco; de hippopotamo: quis primus ostenderit eum Romae et crocodilum. (xli–iii) Medicinae ab animalibus repertae; prognostica periculorum ex animalibus; gentes ab animalibus sublatae. (xliv f.) De hyaenis. de corocottis. de mantichoris. (xlvi) De onagris. (xlvii–ix) De aquaticis et iisdem terrestribus: de fibris, de lutris, de vitulo marino, de stellionibus. (l) De cervis. (li f.) De chamaeleonte; de reliquis colorem mutantibus;

[a] Identified with the *alces* by some naturalists.
[b] Perhaps the hyena.

of domestication; their propagation, and general physiology; native habitat; hostility between elephants and great snakes. (xii) Intelligence of animals. (xiii) Great snakes. (xiv) Serpents of remarkable size. (xv f.) Animals of Scythia; of the north; bisons, bears, the elk, the achlis,[a] the Paeonian bull. (xvii–xxi) Lions—their mode of reproduction, their varieties, their characteristics; who first produced a battle with lions in the circus at Rome? who gave such a show with the largest number of lions? what Roman first harnessed lions to a chariot? remarkable cases among the exploits of lions. (xxii) Man recognised and rescued by a great snake. (xxiii f.) Panthers, resolution of senate and laws as to African; who first showed African panthers at Rome, and when? who showed the largest number? (xxv) Tigers; when was a tiger first seen at Rome? nature of tigers; tiger-cubs. (xxvi–xxx) Camels; their kinds. The giraffe; when first seen at Rome. The spotted lynx. The cephi. The rhinoceros. The lynx and the sphynxes. The crocottae.[b] The long-tailed monkeys. (xxxi–iv) Land animals of India; *ditto* of Ethiopia; a creature the sight of which brings death; basilisk-snakes; wolves; source of the fabulous were-wolf. (xxxv–xl) Snakes, species of; the ichneumon; the crocodile; the African lizard; the hippopotamus: who first showed this animal, and the crocodile at Rome. (xli–iii). Drugs obtained from animals; warnings of dangers from animals; races destroyed by animals. (xliv f.) Hyaenas; corocottae; mantichorae. (xlvi) Wild asses. (xlvii–ix) Amphibious species: beavers, otters, the sea-calf, geckoes. (l) Stags. (li f.) Chameleon; other species that change

tarandro, lycaone, thoe. (liii) De hystrice. (liv) De ursis; de fetu eorum. (lv–viii) De muribus Ponticis et Alpinis, erinaceis, leontophono, lynces, meles, sciuri. (lix f.) De cocleis; de lacertis. (lx–lxiii) Canum natura; exempla eorum circa dominos; qui proeliorum causa canes habuerint; de generatione eorum; contra rabiem remedia. (lxiv–vii) Equorum natura; de ingeniis equorum; mirabilia quadrigarum; generatio equorum; vento concipientes. (lxviii) De asinis; generatio in his. (lxix) Mularum natura et reliquorum iumentorum. (lxx f.) De bubus, generatio eorum; Apis in Aegypto. (lxxii–v) Pecorum natura: generatio eorum; genera lanae et colorum; genera vestium. (lxxvi f.) Caprorum natura et generatio; suum item. (lxxviii f.) De feris subus. quis primus vivaria bestiarum instituerit. (lxxx–ii) De simiis. de leporum generibus. de semiferis animalibus. (lxxxiii) Quae quibus locis animalis non sint; ubi et quae advenis tantum noceant, ubi et quae indigenis tantum. Summa: res et historiae et observationes DCCLXXXVII.

Ex auctoribus: Muciano, Procilio, Verrio Flacco, L. Pisone, Cornelio Valeriano, Catone censorio, Fenestella, Trogo, actis, Columella, Vergilio, Varrone, Lucilio, Metello Scipione, Cornelio Celso, Nigidio, Trebio Nigro, Pomponio Mela, Mamilio Sura. Externis: Iuba rege, Polybio, Herodoto, Antipatro, Aristotele, Demetrio physico, Democrito, Theophrasto, Euanthe, Scopa qui Ὀλυμπιονίκας, Hierone rege, Attalo rege, Philometore rege, Ctesia, Duride, Philisto, Archyta, Phylarcho, Amphilocho Athenaeo, Anaxipoli Thasio, Apollodoro Lemnio, Aristophane Milesio, Antigono Cumaeo, Agathocle Chio, Apollo-

colour—reindeer, lycaon, jackall (liii) The porcupine, (liv) Bears; their reproduction. (lv–viii) Mice, Black Sea and Alpine; hedgehogs, lion-killer, lynxes, badgers, squirrels. (lix f.) Snails; lizards. (lx–lxiii). Dogs, nature of; instances of relation to masters; nations that have kept dogs of war; dog-breeding; cures for rabies. (lxiv–vii) Nature of horses—equine psychology; remarkable four-in-hands; horse-breeding; cases of conception by wind. (lxviii) Asses; breeding in their case. (lxix) Nature of mules and other draft-animals. (lxx f.) Oxen, breeding of. Apis in Egypt. (lxxii–v) Nature of sheep—their breeding; kinds of wool and of colours; kinds of cloth. (lxxvi f.) Goats, their nature and breeding; swine, *ditto*. (lxxviii f.) Wild pigs. Who originated menageries? (lxxx–ii) Apes. Hares, their kinds. Half-wild animals. (lxxxiii) What animals do not occur in what places? which in what places harm only strangers? which in what places only natives?—Total: 787 facts, investigations and observations.

Authorities: Mucianus, Procilius, Verrius Flaccus, Lucius Piso, Cornelius Valerianus, Cato the ex-Censor, Fenestella, Trogus, *Official Records*, Columella, Virgil, Varro, Lucilius, Metellus Scipio, Cornelius Celsus, Nigidius, Trebius Niger, Pomponius Mela, Mamilius Sura. Foreign authorities: King Juba, Polybius, Herodotus, Antipater, Aristotle, Demetrius's *Natural History*, Democritus, Theophrastus, Euanthes, Scopas's *Olympic Victors*, King Hiero, King Attalus, King Philometor, Ctesias, Duris, Philisto, Archytas, Phylarchus, Amphilochus of Athens, Anaxipolis of Thasos, Apollodorus of Lemnos, Aristophanes of Miletus, Antigonus of Cumae, Agathocles of Chios,

nio Pergameno, Aristandro Athenaeo, Bacchio Milesio, Bione Solense, Chaerea Athenaeo, Diodoro, Prienaeo, Dione Colophonio, Epigene Rhodio, Euagone Thasio, Euphronio Athenaeo, Hegesia Maroneo, Menandris Prienaeo et Heracleote, Menecrate poeta, Androtione qui de agricultura scripsit, Aeschrione qui item, Lysimacho qui item, Dionysio qui Magonem transtulit, Diophane qui ex Dionysio epitomen fecit, Archelao rege, Nicandro.

Libro IX. continetur aquatilium natura. (i) Quare maxima in mari animalia. (ii) Indici maris beluae. (iii) Quae in quoque oceano maximae. (iv) De Tritonum et Nereidum figuris. de elephantorum marinorum figuris. (v) De balaenis, de orcis. (vi) An spirent pisces, an dormiant. (vii–x) De delphinis quos amaverint; quibus in locis societate cum hominibus piscentur; alia circa eos mira. (xi) De tursionibus. (xii f.) De testudinibus: quae genera aquatilium testudinum et quomodo capiantur, quis primus testudinem secare instituerit. (xiv) Digestio aquatilium per species. (xv) De vitulis marinis sive phocis; quae pilo careant et quomodo pariant. (xvi) Quot genera piscium. (xvii–xix) Qui maximi pisces; cordylae, pelamydes, thynni; membratim ex his salsura; apolecti, cybia; amiae, scombri. (xx) Qui non sint pisces in Ponto, qui intrent, qui alio[1] redeant. (xxi) Quare pisces extra aquam exiliant. gladius piscis. (xxii) Esse auguria ex piscibus. (xxiii–v) In quo genere piscium mares non sint. qui calculum in capite habeant; qui lateant hieme; qui hieme non capiantur nisi statis diebus; qui aestate lateant; qui siderentur pisces. (xxvi–xxx) De mugile, de acipensere, de

[1] *Rackham*: alia *aut* alias.

Apollonius of Pergamum, Aristander of Athens, Bacchius of Miletus, Bio of Soli, Chaeareas of Athens, Diodorus of Priene, Dio of Colophon, Epigenes of Rhodes, Euagon of Thasos, Euphronius of Athens, Hegesias of Maronea, Menander of Priene and Menander of Heraclea, the poet Menecrates, Androtion *On Agriculture*, Aeschrion *ditto*, Lysimachus *ditto*, Dionysius's translation of Mago, Diophanes's summary of Dionysius, King Archelaus, Nicander.

Book IX. Subject—the nature of aquatic animals. (i) Extreme size of marine animals, reason for. (ii) Monsters of the Indian Sea. (iii) Which are the largest in each Ocean? (iv) Tritons and Nereids, shapes of. Sea elephants, shapes of. (v) Whales, grampuses. (vi) Do fishes breathe? do they sleep? (vii–x) Dolphins, persons loved by; places where they fish in partnership with men; other curious facts as to. (xi) Porpoises. (xii f.) Tortoises—kinds of water-tortoise; mode of capture; who invented cutting tortoise-shells (xiv) Aquatic animals arranged by species. (xv) Sea-calves or seals—which species are hairless? mode of reproduction. (xvi) How many kinds of fish? (xvii–xix). The largest fishes; tunny-fry, young tunny, full-grown tunny; tunny divided and pickled, salted tunny slices, chopped tunny; *amia*-tunny, mackerel-tunny. (xx) Fishes in the Black Sea—which species not found in it, which enter in from elsewhere, which leave it. (xxi) Why fishes leap out of the water. The sword-fish. (xxii) Augury from fishes a fact. (xxiii–v) Species of fish that have no males; that have a stone in the head; that hibernate in winter; that are only caught on certain days in winter; that hide in summer; that are liable to planet-stroke. (xxvi–xxx) Mullet,

lupo, de asello, de scaro, de mustela. mullorum genera. sargus. (xxxi f.) Mirabilia piscium pretia. non ubique eadem genera placere. (xxxiii) Generatim[1] de branchiis, de squamis. (xxxiv) Vocales et sine branchiis pisces; qui in terram exeant; tempora capturae. (xxxvi) Digestio piscium in figuras corporis. rhomborum et passerum differentia. de longis piscibus. (xxxvii) De piscium pinnis et natandi ratione. (xxxviii) Anguillae. (xxxix) Murenae. (xl) Planorum piscium genera. (xli) Echeneis effectusque eius. (xlii) Qui pisces colorem mutent. (xliii) De hirundine; de pisce qui noctibus lucet; de cornuto; de dracone marino. (xliv) De piscibus sanguine carentibus; qui pisces molles appellentur. (xlv) De sepia, de lolligine, de pectunculis; qui volent extra aquam. (xlvi–ix) De polypis; de navigatore polypo. de navigatore nauplio. (l–lii) Crusta intecti: de locustis, cancrorum genera, de pinotere, de echinis, de cocleis, de pectinibus, concharum genera. (liii) Quanta luxuriae materia mari sit. (liv–lix) De margaritis quomodo nascantur et ubi; quomodo inveniantur; quae genera unionum; quae observanda in iis; quae natura eorum; exempla circa eos; quando primum in usum venerint Romae. (lx–lxv) Muricum natura: de purpuris; quae nationes purpurae; quomodo ex his lanae tinguantur; quando purpurae usus Romae, quando lati clavi et praetextae; de conchyliatis vestibus; de amethysto tinguendo; de Tyrio, de hysgino, de cocco. (lxvi) De pina et pinotere. (lxvii) De sensu aquatilium; torpedo, pastinaca, scolopendrae, glanis; de ariete pisce. (lxviii f.) De his quae tertiam naturam habent animalium et fruticum: de urticis; de

[1] *Detlefsen*: generati.

sturgeon, pike, cod, wrasse, lamprey; varieties of mullet; the *sargus*. (xxxi f.) Remarkable prices for fish. Different kinds popular in different places. (xxxiii) Gills in various species; scales *ditto*. (xxxiv f.) Fish with voice, fish without gills; fish that go ashore. Seasons for catching fish. (xxxvi) Classification of fish by shape. Difference between turbot and sparrow-turbot. Long fishes. (xxxvii) Fins and mode of swimming. (xxxviii) Eels. (xxxix) Lampreys. (xl) Kinds of flat-fish. (xli) The remora and how it operates. (xlii) What fish change colours. (xliii) Swallow-fish. The fish that shines by night. The horned fish. The weever. (xliv) The bloodless fishes. The so-called soft fishes. (xlv) The sepia-fish. The cuttle-fish. The small scallops. Flying fish. (xlvi–ix) The polyps, including the sailing polyp. The sailor-fish. (l–lii) Shell-fish: lobster, varieties of crab, the sea-pen's guard, sea-urchins, snails, scallops. Varieties of shell. (liii) Quantity of delicacies supplied by the sea. (liv–lix) Pearls—how do they grow and where, how found; varieties of large pearl—their remarkable features, their nature, instances of their occurrence, when first used at Rome. (lx–lxv) Nature of varieties of purple—the purple-fish; kinds of purple-fish; how used to supply dye for woollens; date of use of purple at Rome, date of purple stripe and purple-bordered robe; purple dyed dresses; dying amethyst; Tyrian, vegetable-scarlet, kermes-scarlet. (lxvi) The sea-pen and the sea-pen's guard. (lxvii) Perception of aquatic animals: the electric ray, sting-ray, scolopendrae, shad, ramming-fish. (lxviii f.) Species intermediate between animal and vegetable: sea-nettles; sponges,

spongeis, quae genera earum et ubi nascantur; animal esse eas. (lxx) De caniculis. (lxxi) De his quae silicea testa cluduntur; quae sine sensu ullo in mari; de reliquis sordium animalibus. (lxxii) De venenatis marinis. (lxxiii) De morbis piscium. (lxxiv–vii) De generatione eorum: mira generationum; qui intra se et ova pariant et animal; quorum in partu rumpatur venter, dein coeat; qui volvas habeant; qui ipsi se ineant. (lxxviii) Quae longissima vita piscium. (lxxix ff.) Quis primus vivaria piscium instituerit. de ostreis; quis murenarum vivaria instituerit; insignia piscinarum; (lxxxii) Quis primus coclearum vivaria instituerit. (lxxxiii) Pisces terreni. (lxxxiv) De muribus in Nilo. (lxxxv) Quomodo capiantur anthiae pisces. (lxxxvi) De stellis marinis. (lxxxvii) De dactylorum miraculis. (lxxxviii) de inimicitiis inter se aquatilium et amicitiis. Summa: res et historiae et observationes DCL.

Ex auctoribus: Turranio Gracile, Trogo, Maecenate, Alfio Flavo, Cornelio Nepote, Laberio mimographo, Fabiano, Fenestella, Muciano, Aelio Stilone, Seboso, Melisso, Seneca, Cicerone, Macro Aemilio, Messala Corvino, Trebio Nigro, Nigidio. Externis: Aristotele, Archelao rege, Callimacho, Democrito, Theophrasto, Thrasyllo, Hegesidemo, Sudine, Alexandro polyhistore.

Libro X. continentur volucrum naturae. (i f.) De struthocamelo, phoenice. (iii–vi) Aquilarum genera, natura earum; quando legionum signa esse coeperint; de aquila quae in rogum virginis se misit. (vii) Voltur. (viii) Avis sanqualis, immusulus. (ix–xi) Accipitres: buteo; in quibus locis societate accipitres et homines aucupentur; quae avis sola a suo genere interimatur; quae avis singula ova

their kinds and habitat; sponges, living creatures. (lxx) Sea-bitches. (lxxi) Flint-shell fish; marine animals without senses; other low species. (lxxii) Venomous marine animals. (lxxiii) Diseases of fishes. (lxxiv–vii) Their reproduction—curious reproductive methods; species both oviparous and viviparous; delivery by rupture of the stomach, afterwards closing up; species possessing matrix; self-fertilizing species. (lxxviii) Longest life of fish. (lxxix–lxxxi) First inventor of fish-ponds; oysters; who invented lamprey-ponds. Notable fish-ponds; who first invented snail-ponds. (lxxxiii) Land fishes. (lxxxiv) Mouse-fish in the Nile. (lxxxv) Flower-fish, mode of catching. (lxxxvi) Starfish. (lxxxvii) Remarkable species of finger-fish. (lxxxviii) Instances of hostility and friendship between aquatic animals.—Total: 650 facts, investigations and observations.

Authorities: Turranius Gracilis, Trogus, Maecenas, Alfius Flavus, Cornelius Nepos, the *Mimes* of Laberius, Fabianus, Fenestella, Mucianus, Aelius Stilo, Sebosus, Melissus, Seneca, Cicero, Aemilius Macer, Corvinus Messala, Trebius Niger, Nigidius. Foreign authorities: Aristotle, King Archelaus, Callimachus, Democritus, Theophrastus, Thrasyllus, Hegesidemus, Sudines, Alexander the Learned.

Book X. Subject—the nature of birds. (i f.) The ostrich, the phoenix. (iii–vi) Eagles, their species; their nature; when adopted as regimental badges; self-immolation of eagle on maiden's funeral pyre. (vii) The vulture. (viii) Lämmergeier, sea-eagle (?) (ix–xi) Hawks: the buzzard; use of hawks by fowlers where practised; the only bird that is killed by its own kind; what bird produces one egg at a time. (xii)

pariat. (xii) Milvi. (xiii) Digestio avium per genera. (xiv–xvi) De inauspicatis avibus; cornices quibus mensibus non sint inauspicatae: de corvis; de bubone. (xvii) Aves quarum vita aut notitia intercidit. (xviii) Quae a cauda nascantur. (xix) De noctuis. (xx) De pico Martio. (xxi) De his quae uncos unguis habent. (xxii–v) De his quae digitos habent: de pavonibus; quis primus pavonem cibi causa occiderit; quis farcire instituerit; de gallinaceis, quomodo castrentur; de gallinaceo locuto. (xxvi) De ansere. (xxvii) Quis primum iecur anserinum instituerit; de Commageno; chenalopeces, chenerotes, tetraones, otides; grues; de ciconiis; de palmipede reliquo genere; de oloribus. (xxxiii–v) De avibus peregrinis quae veniunt: coturnices, glottides, cychramus, otus; de avibus nostris quae discedunt, et quo abeant: hirundines, turdi, merulae, sturni; de avibus quae plumas amittunt in occultatione: turtur, palumbes. (xxxvi) Quae avium perennes, quae semestres, quae trimestres: galguli, upupae. (xxxvii–xl) Memnonides; meleagrides; seleucides; ibis. (xli) Quae quibus locis aves non sint. (xlii–v) Quae mutent colorem et vocem: de oscinum genere; de luscinis; de melancoryphis, erithacis, phoenicuris, oenanthe, chlorio. (xlvi) Tempus avium geniturae. (xlvii) Halcyones: dies earum navigabiles. (xlviii) De reliquo aquaticarum genere. (xlix–li) Sollertia avium in nidis: hirundinum opera mira; ripariae; acanthyllis; merops; de perdicibus. (lii f.) De columbis; opera earum mirabilia et pretia. (liv f.) Differentiae volatus avium et incessus; apodes sive cypseli. (lvi) De pastu avium. caprimulgi, platea. (lvii) De ingeniis avium; carduelis, taurus, anthus. (lviii–lx) De avibus quae

Kites. (xiii) Classification of birds by species. (xiv–xvi) Birds of ill-omen; in what months crows are not a bad omen; ravens; the horned owl. (xvii) Extinct birds; birds no longer known. (xviii) Birds hatched tail first. (xix) Night-owls. (xx) Mars's woodpecker. (xxi) Birds with hooked talons. (xxii–v) Birds with toes: peacocks; who first killed the peacock for food; who invented fattening peacocks; poultry—mode of castrating; a talking cock. (xxvi–xxxii) The goose; who first introduced goose-liver (foie gras); Commagene goose; fox-goose, love-goose, heath-cock, bustard; cranes; storks; rest of reflexed-claw genus; swans. (xxxiii–v) Foreign migrant birds: quails, tongue-birds, ortolan, horned owl; native migrant birds and their destinations—swallows, thrushes, blackbirds, starlings; birds that moult in retirement: turtle-dove, ring-dove. (xxxvi) Non-migrant birds: half-yearly and quarter-yearly visitors: witwalls, hoopoes. (xxxvii–xl) Memnon's hens, Meleager's sisters (guinea-hens), Seleucid hens, ibis. (xli) Where particular species not known. (xlii–v) Species that change colour and voice: the divination-bird class; nightingale, black-cap, robin, red-start, chat, golden oriole. (xlvi) The breeding season. (xlvii) Kingfishers: sign of fine weather for sailing. (xlviii) Remainder of aquatic class. (xlix–li) Craftsmanship of birds in nest-making; remarkable structures of swallows; sand-martins; thistle-finch; bee-eater; partridges. (lii f.) Pigeons—remarkable structures of, and prices paid for; (liv f.) Varieties of birds' flight and walk; footless martins or swifts. (lvi) Food of birds. Goat-suckers, spoon-bill. (lvii) Intelligence of birds; gold-finch, bull-bittern, yellow wagtail. (lviii–lx)

locuntur: psittaci; picae glandares; propter corvom loquentem seditio populi Romani. (lxi) Diomediae. (lxii) Quae animalia nihil discant. (lxiii) De potu avium; de porphyrione. (lxiv) Himantopodes. (lxv f.) De pastu avium. onocrotali. (lxvii f.) De peregrinis avibus: Phalerides, Phasianae, Numidicae, phoenicopteri, attagenae, phalacrocoraces, pyrrhocoraces, lagopodes. (lxix) De novis avibus: vipiones.[1] (lxx) De fabulosis avibus. (lxxi f.) Quis gallinas farcire instituerit, quique hoc primi consules vetuerint; quis primus aviaria instituerit; de Aesopi patina. (lxxiii–lxxx) Generatio avium: quae praeter aves ova gignant; ovorum genera et naturae; vitia et remedia incubantium; Augustae ex ovis augurium; quales gallinae optimae; morbi earum et remedia; ardeolarum genera; quae sint ova urina, quae cynosura, quae hypenemia; quomodo optime serventur ova. (lxxxi f.) Quae volucrum sola animalia pariat et lacte nutriat. quae terrestrium ova pariant. serpentium generatio. (lxxxiii–vii) Terrestrium omnium generatio; quae sit animalium in uteris positio; quorum animalium origo adhuc incerta sit; de salamandris; quae nascantur ex non genitis; quae nata nihil gignant; in quibus neuter sexus sit. (lxxxviii–xc) De sensibus animalium: tactus omnibus esse; item gustatus; quibus visus praecipuus, quibus odoratus, quibus auditus; de talpis; an ostreis auditus; qui ex piscibus clarissime audiant; qui ex piscibus maxime odorentur. (xci–iii) Diversitas animalium in pastu: quae venenis vivant; quae terra; quae fame aut siti non intereant. (xciv) De diversitate potus. (xcv f.) Quae inter se dissi-

[1] *Sillig* (cf. X 135): bibiones *aut* bubones.

Talking birds: parrots, acorn-pies; riot at Rome caused by talking crow. (lxi) Diomede's birds. (lxii) What animals learn nothing. (lxiii) Birds, mode of drinking; the sultana hen. (lxiv) The long-legs. (lxv f.) Food of birds. Pelicans. (lxvii f.) Foreign birds: coots, pheasants, Numidian fowl, flamingoes, heath-cock, bald crow or cormorant, red-beaked or Alpine crow, bare-footed crow or ptarmigan. (lxix) New species: small cranes. (lxx) Fabulous birds. (lxxi) Who invented fattening of chickens, and which consuls first prohibited? who first invented aviaries? Aesop's stewpan. (lxxiii–lxxx) Reproduction of birds: oviparous creatures other than birds; kinds and properties of eggs; defective hatching and its cures; Augusta's augury from eggs; what sort of hens the best? their diseases and remedies; kinds of small heron; nature of puff-eggs, addled eggs, wind-eggs; best way of preserving eggs. (lxxxi f.) The only species of bird that is viviparous and suckles its young. Oviparous species of land animals. Reproduction of snakes. (lxxxiii–vii) Reproduction of all land animals; posture of animals in the uterus; animal species whose mode of birth is still uncertain; salamanders; species not reproduced by generation; species whose generated offspring is unfertile; sexless species. (lxxxviii–xc) Senses of animals: all have sense of touch, also taste; species with exceptional sight, smell, hearing; moles; have oysters hearing? which fishes hear most clearly? which fishes have keenest sense of smell? (xci–iii) Difference of food in animals: which live on poisonous things? which on earth? which do not die of hunger of thirst? (xciv) Variety of drink. (xcv f.) Species mutually hostile; facts as to friendship and

deant; amicitiam animalium esse et affectus animalium; exempla affectus serpentium. (xcvii f.) De somno animalium; quae somnient. Summa: res et historiae et observationes DCCXCIV.

Ex auctoribus: Manilio, Cornelio Valeriano, actis, Umbricio Meliore, Masurio Sabino, Antistio Labeone, Trogo, Cremutio, M. Varrone, Macro Aemilio, Melisso, Muciano, Nepote, Fabio Pictore, T. Lucretio, Cornelio Celso, Horatio, Deculone, Hygino, Sasernis, Nigidio, Mamilio Sura. Externis: Homero, Phemonoe, Philemone, Boetho qui ὀρνιθογονίαν, Hyla qui de auguriis, Aristotele, Theophrasto, Callimacho, Aeschylo, Hierone rege, Philometore rege, Archyta Tarentino, Amphilocho Atheniense, Anaxipoli Thasio, Apollodoro Lemnio, Aristophane Milesio, Antigono Cumaeo, Agathocle Chio, Apollonio Pergameno, Aristandro Athenaeo, Bacchio Milesio, Bione Solense, Chaerea Atheniense, Diodoro Prienaeo, Dione Colophonio, Democrito, Diophane Nicaeense, Epigene Rhodio, Euagone Thasio, Euphronio Athenaeo, Iuba, Androtione qui de agricultura, Aeschrione qui item, Lysimacho qui item, Dionysio qui Magonem transtulit, Diophane qui ex Dionysio epitomen fecit, Nicandro, Onesicrito, Phylarcho, Hesiodo.

Libro XI. continentur insectorum animalium genera. (i) Subtilitas in his rebus naturae. (ii) An spirent, an habeant sanguinem. (iii) De corpore eorum. (iv–xxiii) De apibus; qui ordo in opere earum; quid sit in eo commosis, quid sit pissoceros, quid sit propolis, quid erithace sive sandaraca sive cerinthos; ex quibus floribus opera fiant; apium studio capti; de fucis; quae natura mellis, quae optima mella, quae genera mellis in singulis locis, quomodo probentur; de erice sive tetralice sive

affection between animals; instances of affection between snakes. (xcvii f.) Sleep of animals; which species sleep? Total: 794 facts, investigations and observations.

Authorities: Manilius, Cornelius Valerian, *Records*, Umbricius Melior, Masurius Sabinus, Antistius Labeo, Trogus, Cremutius, Marcus Varro, Aemilius Macer, Melissus, Mucianus, Nepos, Fabius Pictor, Titus Lucretius, Cornelius Celsus, Horace, Deculo, Hyginus, the Sasernae, Nigidius, Mamilius Sura. Foreign authorities: Homer, Phemonoe, Philemon, Boethus's *Ornithogonia*, Hylas's *Auguries*, Aristotle, Theophrastus, Callimachus, Aeschylus, King Hiero, King Philometor, Archytas of Tarentum, Amphilochus of Athens, Anaxipolis of Thasos, Apollodorus of Lemnos, Aristophanes of Miletus, Antigonus of Cumae, Agathocles of Chios, Apollonius of Pergamum, Aristander of Athens, Bacchius of Miletus, Bion of Soli, Chaereas of Athens, Diodorus of Priene, Dion of Colophon, Democritus, Diophanes of Nicaea, Epigenes of Rhodes, Evagon of Thasos, Euphronius of Athens, Juba, Androtion *On Agriculture*, Aeschrio *ditto*, Lysimachus *ditto*, Dionysius's translation of Mago, Diophanes's epitome of Dionysius, Nicander, Onesicritus, Phylarchus, Hesiod.

Book XI. Subject—the kinds of insects. (i) Nature's subtlety in this department. (ii) Do insects breathe? have they blood? (iii) Their bodies. (iv–xxiii) Bees—structure of their comb; its materials, gum, pitch-wax, bee-glue, bee-bread (*sandarach*, *cerinthus*); flowers from which materials derived; instances of bee-lovers; drones; nature of honey; the best honey; unique local varieties of honey; test of varieties; heather (heath, *sisyrus*); repro-

sisyro; quomodo apes generent; quae regum in iis ratio; aliquando et laetum omen esse examinum; genera apium; de morbis apium; quae inimica apibus; de continendis apibus, de reparandis. (xxiv) De vespis et crabronibus. quae animalia ex alieno suum faciant. (xxv–vii) De bombyce Assyria: de bombyliis, necydalis; quae prima invenerit bombycinam vestem; de bombyce Coa; quomodo conficiatur Coa vestis. (xxviii f.) De araneis qui ex iis texant; quae materiae natura ad texendum; generatio araneorum. (xxx ff.) De scorpionibus; de stellionibus; de cicadis sine ore esse et sine exitu cibi. (xxxiii) De pinnis insectorum. (xxxiv–vi) De scarabaeis; lampyrides; reliqua scarabaeorum genera; de locustis; de formicis. (xxxvii–ix) Chrysallides, asilus, papiliones; de his animalibus quae ex ligno aut in ligno nascantur; sordium hominis animalia; quod animal minimum; aestatis animalia. (xl) Animal cui cibi exitus non sit. (xli–iii) Tineae, cantharides, culices; nivis animal; ignium animal, pyrallis sive pyrotos; hemerobion. (xliv–xcvii) Animalium omnium per singula membra naturae et historiae: quae apices habeant, quae cristas. (xlv–li) Cornuum genera: quibus mobilia; de capitibus: quibus nulla; de capillo; de ossibus capitis; de cerebro; de auribus: quae aures non habeant, quae sine auribus et sine foraminibus audiant; de facie, de fronte, de supercilis. (lii–lvii) De oculis: quae sine oculis animalia; quae singulos tantum oculos habeant; de diversitate oculorum; quae ratio visus; noctu videntes; de natura pupillae; quae non coniveant; quibus eruti oculi renascantur; de palpebris: quibus non sint, quibus ab altera tantum parte sint; quibus genae non sint. (lviii-

duction of bees; their system of royalty; swarming sometimes actually a good omen; kinds of bees; diseases of bees; enemies of bees; beekeeping; replenishment of stock. (xxiv) Wasps and hornets. What animals reproduce from another species? (xxv–vii) Assyrian silk-worm: chrysalis, larva; inventor of silk fabric; silk-worm of Cos; manufacture of Coan silk. (xxviii f.) Spiders—which varieties make webs; material used in webs; mode of reproduction. (xxx ff.) Scorpions; geckoes; grasshoppers—their lack of mouth and vent. (xxxiii) Insects' wings. (xxxiv–vi) Beetles; glowworms; other kinds of beetle; locusts; ants. (xxxvii–ix) Chrysalises, gad-flies, butterflies; animals born from wood or in wood; animals of human refuse; which is the smallest animal? summer animals. (xl) Ventless animal. (xli–iii) Moths, beetles, gnats; snow-animal; fire-animal (*pyrallis* or *pyrotos*); may-flies. (xliv–xcviii) Nature and account of all animals arranged according to the parts of the body: species possessing caps; crested species. (xlv–li) Varieties of horn—which species can move the horns; heads, headless species; hair; bones of head; brain; ears—which species have none, which hear without ears or apertures; face, brow, eye-brow. (lii–lvii) Eyes: what animals without eyes, what with only one eye; varieties of eyes; method of sight; species that see by night; structure of pupil; species that do not close the eyes; species whose eyes after being destroyed grow again; eyelashes—species that lack, species with lashes on only one lid; species with no eyelids.

lx) De malis; de naribus; buccis, labris, mento maxillis. (lxi–iv) De dentibus: quae genera eorum; quibus non utraque parte sint, quibus cavi; de serpentium dentibus, de veneno earum; cui volucri dentes; mirabilia dentium; aetas ruminantium ab his. (lxv) De lingua: quae sine ea; de ranarum sono; de palato. (lxvi–viii) De tonsillis; uva, epiglossis, arteriae, gula, cervix, collum, spina, guttur, fauces, stomachus. (lxix–lxxi) De corde, sanguine, animo; quibus maxima corda, quibus minima, quibus bina; quando in extis adspici coepta. (lxxii) De pulmone: quibus maximus, quibus minimus, quibus nihil aliud quam pulmo intus; quae causa velocitatis animalium. (lxxiii–vi) De iocinere, de capite extorum; haruspicum circa id observationes; quibus animalibus et in quibus locis bina iocinera; de felle: ubi et in quibus geminum; quibus animalium non sit, quibus animalium alibi quam in iocinere; quae vis eius; quibus crescat cum luna et decrescat iecur; haruspicum circa ea observationes et prodigia mira. (lxxvii) Praecordia; risus natura. (lxxviii) De ventre; quibus nullus; quae sola vomant. (lxxix) Lactes, hillae, alvos, colon; quare quaedam insatiabilia animalia. (lxxx–iii) De omento, de splene; quibus animalium non sit; de renibus; ubi quaterni animalibus; quibus nulli; pectus, costae, vesica; quibus animalibus non sit; ilia; de membranis. (lxxxiv–viii) Uterus: de locis, de volvis, de suum volva, sumine; quae adipem, quae sebum habeant; de natura utriusque; quae non pinguescant; de medullis; quibus non sint; de ossibus; de spinis; quibus nec ossa nec spinae; cartilagines; de nervis; quae

(lviii–lx) Cheek-bones; nostrils; cheeks, lips, chin, jaws. (lxi–iv) Teeth—kinds of; species with teeth in one jaw only; with hollow teeth; snakes' teeth, snakes' poison; which bird has teeth; remarkable facts as to teeth; age of ruminants indicated by teeth. (lxv) Tongue—tongueless species; croaking of frogs; palate. (lxvi–viii) Tonsils; uvula, epiglottis, windpipe, gullet, nape, neck, backbone, throat, jaws, stomach. (lxix–lxxi) Heart, blood, life; which species has largest heart, which smallest, which two hearts; when inspection of heart of victims began; (lxxii) Lungs—which species has largest, which smallest, which no internal organ besides lungs; cause of speed in animals. (lxxiii–vi) Liver—head of internal organs; its inspection by augurs; species with two livers, and their habitats; gall—what species have two, and where; what animals have none, which have gall elsewhere than in liver; its function; species whose gall grows and shrinks in size with moon; observation of these species by augurs, and marvellous portents. (lxxvii) Diaphragm; nature of laughter. (lxxviii) Stomach; species that have none; the only species that vomit. (lxxix) Smaller intestines, entrails, stomach, great gut; why some animals have voracious appetites. (lxxx–iii) Caul, spleen—species without spleen. Kidneys; habitat of species with four kidneys—with none; chest; ribs; bladder—animals without bladder; entrails; membranes. (lxxxiv–viii) Belly—the 'parts,' the womb, sows' womb, paps; what species have suet, what tallow; nature of each; what species have no fat; marrow; species that have none; bones; prickles; species that have neither bones nor prickles; cartilages; sinews; species without sinews. (lxxxix–

sine nervis. (lxxxix–xcii) Arteriae, venae; quae nec venas nec arterias habeant; de sanguine; de sudore; quorum celerrime sanguis spissetur, quorum non coeat; quibus crassissimus, quibus tenuissimus, quibus nullus, quibus certis temporibus anni nullus; an in sanguine principatus. (xciii f.) De tergore; de pilis et vestitu tergoris; quibus os intus et pedes subtus hirti. (xcv–xcvii) De mammis; quae volucrum mammas habeant. notabilia animalium in uberibus; de lacte; quod solum animal sugat in cursu; de colostris; de caseis; ex quibus non fiat; de coagulo; genera alimenti ex lacte; genera caseorum. (xcviii–cxiii) Differentiae membrorum hominis a reliquis animalibus: de digitis, de brachiis; de simiarum similitudine; de unguibus; de genibus et poplitibus; in quibus membris corporis humani sit religio; varices; de gressu, de pedibus et cruribus; de ungulis; volucrum pedes; pedes animalium a binis ad centenos; de pumilionibus; de genitalibus; de hermaphroditis; de testibus; trium generum semiviri; de caudis; de vocibus animalium; de agnascentibus membris. (cxiv) Vitalitatis et morum notae ex membris hominum. (cxv f.) De anima; de victu; quae veneno pasta ipsa non pereant et gustata necent. (cxvii–ix) Quibus de causis homo non concoquat; de remediis cruditatum; quemadmodum corpulentia contingat, quemadmodum minuatur; quae gustu famem et sitim sedent. summa: res et historiae et observationes MMDCC.

Ex auctoribus: M. Varrone, Hygino, Scrofa, Saserna, Celso Cornelio, Aemilio Macro, Vergilio, Columella, Iulio Aquila qui de Etrusca disciplina scripsit, Tarquitio qui item, Umbricio Meliore qui

xcii) Arteries, veins; species with neither veins nor arteries; blood; sweat; species whose blood thickens most quickly, whose blood does not coagulate; which species has the thickest blood, the thinnest, none at all, none at certain seasons of the year; whether blood is dominant factor in body. (xciii f.) Back; hair and integument of back; species having hair inside mouth and under feet. (xcv–xcvii) Paps; which birds have paps; noteworthy points about animals' udders; milk; which the only animal that gives suck while in motion; biestings; cheese; species whose milk does not form cheese; curdled milk; kinds of food obtained from milk; kinds of cheese. (xcviii–cxiii) Differences in limbs between man and other animals; the fingers; arms; resemblance to monkeys; nails; knees and thighs; which parts of human body associated with ritual; dilated veins; gait, feet and legs; hooves; feet of birds; feet of animals, between 2 and 100; dwarfs; genital organs; hermaphrodites; testicles; three kinds of half-man; tails; voices of animals; limbs of subsequent growth. (cxiv) Marks of vitality and character derived from conformation of limbs in man. (cxv) Respiration; nutrition; animals that from eating poison do not die, but kill those who taste them. (cxvii–ix) Causes of indigestion in man; remedies for indigestion; cause of corpulence, and mode of reduction; things whose taste allays hunger and thirst. Total: 2700 facts, investigations and observations.

Authorities: Marcus Varro, Hyginus, Scrofa, Saserna, Cornelius Celsus, Aemilius Macer, Virgil, Columella, Julius Aquila's *Etruscan System*, Tarquitius *ditto*, Umbricius Melior *ditto*, Cato the ex-

item, Catone censorio, Domitio Calvino, Trogo, Melisso, Fabiano, Muciano, Nigidio, Mamilio, Oppio. Externis: Aristotele, Democrito, Neoptolemo qui μελιτουργικά, Aristomacho qui item, Philisco qui item, Nicandro, Menecrate, Dionysio qui Magonem transtulit, Empedocle, Callimacho, Attalo rege, Apollodoro qui de bestiis venenatis, Hippocrate, Herophilo, Erasistrato, Asclepiade, Themisone, Posidonio Stoico, Menandris Prienaeo et Heracleote, Euphronio Athenaeo, Theophrasto, Hesiodo, Philometore rege.

Libro XII. continentur arborum naturae. (i, ii) Honor earum. (iii–lxiii) De peregrinis arboribus. (iii–vi) Platanus; quando primum in Italiam et unde; natura earum; miracula ex iis; chamaeplatani; quis primus viridiaria tondere instituerit. (vii) Malum Assyrium quomodo seratur. (viii–xvii) Indiae arbores: quando primum Romae hebenus visa; quae genera eius; spina Indica; ficus Indica; Indicarum arborum formosae sine nominibus; liniferae Indorum arbores; arbor pala, pomum ariena; piperis arbores, genera piperis, bregma, zingiberi sive zimpiberi, caryophyllon, lycium sive pyxacanthum Chironium, macir, saccharon. (xviii f.) Arbores Arianae gentis, item Gedrosiae, item Hyrcaniae, item Bactriae; bdellium sive brochum sive malacham sive maldacum; scordasti. in omnibus odoribus aut condimentis dicuntur adulterationes, experimenta, pretia. (xx f.) Persidis arbores: Persici maris insularum arbores; gossypinum arbor. (xxii–iv) Cynas arbor. ex quibus arboribus lintea in oriente fiant; quo in loco arborum nullis folia decidant; quibus modis constent arborum fructus. (xxv–xxix) De costo; de nardo,

Censor, Domitius Calvinus, Trogus, Melissus, Fabianus, Mucianus, Nigidius, Manilius, Oppius. Foreign authorities: Aristotle, Democritus, Neoptolemus's *Production of Honey*, Aristomachus *ditto*, Philiscus *ditto*, Nicander, Menecrates, Dionysius's translation of Mago, Empedocles, Callimachus, King Attalus, *Venomous Animals* by Apollodorus, Hippocrates, Herophilus, Erasistratus, Asclepiades, Themiso, Posidonius the Stoic, Menander of Priene, Menander of Heraclea, Euphronius of Athens, Theophrastus, Hesiod, King Philometor.

Book XII. Contents: trees—their various qualities. (i, ii) In praise of trees. (iii–lxiii) Foreign trees. (iii–vi) Plane—when and whence first introduced into Italy; their nature; remarkable products; dwarf planes; who first introduced the pruning of garden trees. (vii) Assyrian apple, instructions for planting. (viii–xvii) Indian trees; ebony, when first seen at Rome; its kinds; Indian thorn; Indian fig; beautiful unnamed Indian trees; Indians' flax-trees; plantain tree, its fruit bananas; pepper trees, kinds of pepper, defective pepper, ginger, nut-leaf, wolf-plant or Chiron's box-thorn, *macir*, sugar-cane. (xviii f.) Trees of the Arian race, *ditto* of Gedrosia, *ditto* of Hyrcania, *ditto* of Bactria; myrrh plant or gum-plant (*malacha, maldacum*); *germander*. Modes of adulteration, tests and prices specified for all scents or spices. (xx f.) Trees of Persia; trees of islands in Persian Gulf; cotton-tree. (xxii–iv) Cynas tree; trees used in East for making linen; locality with no deciduous trees; modes in which trees form fruits. (xxv–xxix) *Costus*; nard, its

differentiae eius XII; asaron; amomum, amomis, cardamomum. (xxx–xxxii) De turifera regione, de arboribus quae tus ferunt; quae natura turis et quae genera. (xxxiii–v) De myrrha: de arboribus quae ferunt eam; natura et genera myrrhae. (xxxvi–xl) De mastiche; de ladano, scorbo, enhaemo; bratus arbor; stobrum arbor. (xli) De felicitate Arabiae. (xlii–xlvii) De cinnamo, cinnamomo, xylocinnamo; casia, cancamum, tarum; serichatum, gabalium; myrobalanus; phoenicobalanus. (xlviii–lxi) De calamo odorato, de iunco odorato; hammoniacum; sphagnos; cypros; aspalathos sive erysisceptrum; maron; de balsamo, opobalsamo, xylobalsamo; styrax; galbanum; de panace; spondylion; de malobathro; de omphacio; bryon, oenanthe, massaris; elate vel spathe; cinnamum comacum. Summa: res et historiae et observationes CCCCLXVIII.

Ex auctoribus: M. Varrone, Muciano, Vergilio, Fabiano, Seboso, Pomponio Mela, Flavio Procilio, Hygino, Trogo, Claudio Caesare, Cornelio Nepote, Sextio Nigro qui Graece de medicina scripsit, Cassio Hemina, L. Pisone, Tuditano, Antiate. Externis: Theophrasto, Herodoto, Callisthene, Isogono, Clitarcho, Anaximene, Duride, Nearcho, Onesicrito, Polycrito, Olympiodoro, Diogneto, Nicobulo, Anticlide, Charete Mytilenaeo, Menaechmo, Dorotheo Athenaeo, Lyco, Antaeo, Ephippo, Dinone, Adimanto, Ptolemaeo Lagi, Marsya Macedone, Zoilo item, Democrito, Amphilocho, Aristomacho, Alexandro polyhistore, Iuba, Apollodoro qui de odoribus, Heraclide medico, Botrye medico, Archedemo item, Dionysio item, Democede item, Euphrone item, Mneside item, Diagora item, Iolla item, Heraclide Tarentino, Xenocrate Ephesio.

12 varieties; hazelwort; *amomum*, *amomis*, cardamon. (xxx–xxxii) The incense-producing district, incense-bearing trees; nature and kinds of incense. (xxxiii–v) Myrrh: trees that produce it; nature and kinds of myrrh. (xxxvi–xl) Mastic; ladanum, scorbus, styptic, *bratus* tree; *stobrum* tree. (xli) Arabia, why happy. (xlii–xlvii) Cinnamon, cinnamomum, cinnamon-shrub; wild cinnamon, cancamum, aloe-wood; serichatum, gabalium; behen-nut; Egyptian date. (xlviii–lxi) Scented reed, scented rush; Hammonian gum-tree; fragrant moss; cyprus; calycotome or *erysisceptrum*; cat-thyme; balsam, balsam-juice, balsam-wood; *styrax; galbanum;* all-heal; bear's-foot: cinnamon-leaf; grape-plant; moss, vine-flower, wild vine; fir or larch; cinnamon *comacum*. Total: 468 facts, investigations and observations.

Authorities: Marcus Varro, Mucianus, Virgil, Fabianus, Sebosus, Pomponius Mela, Flavius Procilius, Hyginus, Trogus, Claudius Caesar, Cornelius Nepos, Greek *Treatise on Medicine* by Sextius Niger, Cassius Hemina, Lucius Piso, Tuditanus, Antias. Foreign authorities: Theophrastus, Herodotus, Callisthenes, Isogonus, Clitarchus, Anaximenes, Duris, Nearchus, Onesicritus, Polycritus, Olympiodorus, Diognetus, Nicobulus, Anticlides, Chares of Mitylene, Menaechmus, Dorotheus of Athens, Lycus, Antaeus, Ephippus, Dinon, Adimantus, Ptolemy son of Lagus, Marsyas of Macedon, Zoilus of Macedon, Democritus, Amphilochus, Aristomachus, Alexander the Learned, Juba, Apollodorus *On Scents*; the physicians Heraclides, Botrys, Archedemus, Dionysius, Democedes, Euphron, Mnesides, Diagoras and Iollas; Heraclides of Tarentum, Xenocrates of Ephesus.

Libro XIII. continentur: de peregrinis arboribus. (i–v) De unguentis; quando coeperint; genera eorum et conpositiones XII; diapasmata, magmata et probatio unguenti; quanta in unguentis luxuria; quando primum Romanis in usu. (vi–ix) De palmis; de natura earum; quomodo serantur; genera fructus earum et insignia XVIII. (x–xiii) Syriae arbores: pistacia, cottana, Damascena, myxa; cedrus; quae arbores trium annorum fructum pariter habeant; terebinthus; rhus. (xiv–xvi) Aegypti arbores: ficus Alexandrina; ficus Cypria; siliqua ceronia. (xvii–xx) Persica arbor; quibus arboribus subnascatur fructus; cuci; spina Aegyptia; cummium genera VIII, sarcocolla. (xxi–vii) De papyro: de chartae usu; quando coeperit; quomodo fiat; genera eius IX; probatio chartarum; vitia chartarum; de glutino chartarum; de libris Numae. (xxviii) Aethiopiae arbores. (xxix–xxxi) Atlantica arbor; de citri arbore; de citreis mensis, quae probentur aut vituperentur in iis; malum citreum. (xxxii–iv) Lotos; Cyrenaicae arbores, paliurus; Punici mali genera IX, balaustium. (xxxv–xlvii) Asiae et Graeciae arbores: epicactis, erice, granum Cnidium sive thymelaea sive chamelaea sive pyrosachne sive cnestor sive cneorum; tragion, tragacantha; tragos sive scorpio, myrice sive brya, ostrys; eunonymus; leon arbor; andrachne; coccygia, aphace; ferula; Thapsia; capparis sive cynosbaton sive ophiostaphyle; sanpha; spina regia; cytisus. (xlviii–lvii) Arbores et frutices in mari nostro; in mari rubro; item in Indico; item in Trogodytico phycos, grasson sive zoster, bryon marinum, Isidos plocamos, Chariton blepharon. Summa: res et historiae et observationes CCCCLXVIII.

Book XIII. Contents: On foreign trees. (i–v) Perfumes—when invented; 12 kinds and combinations; ointments, salves, testing of perfumes; perfume as promoting luxury; when first in use at Rome. (vi–ix) Palms—their nature; how planted; 18 kinds of fruit and noteworthy facts. (x–xii) Trees of Syria: pistachio, small fig, damson, Syrian plum; cedar; what trees carry three years' fruit at once; terebinth; sumac. (xiv–xvi) Trees of Egypt: Alexandrian fig; Cyprian fig; Carob. (xvii–xx) Persian tree; what trees produce a succession of fruit; *cuci* palm; Egyptian thorn; gum tree, 8 kinds; Persian gum. (xxi–vii) Papyrus; employment of paper; when begun; how manufactured; 9 kinds; mode of testing papers; defects of papers; paper-glue; Books of Numa. (xxviii) Trees of Ethiopia. (xxix) Atlantic tree; citrus-tree; citrus-wood tables, their merits and defects; citrus-fruit. (xxxii–iv) Lotus; trees of Cyrenaica, Christ's-thorn; pomegranate, 9 kinds, wild pomegranate. (xxxv–xlvii) Trees of Asia and Greece; helleborine, heath, seed of Cnidus or altar-plant or carline thistle or fire-foam or *cnestor* or mezereon; goat-plant, goat-thorn; goat or scorpion, tamarisk or brya, hop-hornbeam; euonymus; lion-tree; purslane; cuckoo-plant, tare; fennel; Thapsus-shrub; caper-bush or dog's bush or snake-vine; *saripha*; king's thorn; tree-medick. (xlviii–lvii) Trees and bushes of the Mediterranean; of the Red Sea; of the Indian Ocean; of Cave-dwellers' Sea—sea-weed, *grasson* or girdle-plant, sea-lettuce, plait of Isis, Graces' eyelid. Total 468 facts, investigations and observations.

Ex auctoribus: M. Varrone, Muciano, Vergilio, Fabiano, Seboso, Pomponio Mela, Flavio Procilio, Hygino, Trogo, Claudio Caesare, Cornelio Nepote, Sextio Nigro qui Graece de medicina scripsit, Cassio Hemina, L. Pisone, Tuditano, Antiate. Externis: Theophrasto, Herodoto, Callisthene, Isigono, Clitarcho Anaximene, Duride, Nearcho, Onesicrito, Polycrito, Olympiodoro, Diogneto, Nicobulo, Anticlide, Charete Mytilenaeo, Menaechmo, Dorotheo Atheniense, Lyco, Antaeo, Ephippo, Dinone, Adimanto, Ptolemaeo Lagi, Marsya Macedone, Zoilo item, Democrito, Amphilocho, Aristomacho, Alexandro polyhistore, Iuba, Apollodoro qui de odoribus *scripsit*, Heraclide medico, Botrye medico, Archedemo item, Dionysio item, Democede item, Euphrone item, Mneside item, Diagora item, Iolla item, Heraclide Tarentino, Xenocrate Ephesio.

Libro XIV. continentur fructiferae arbores. (i–v) De vitium natura; quibus modis ferant; de uvarum natura et cura; vitium et uvarum genera XCI; insignia culturae et vinearum; (vi–xi) De inventione mulsi; vina generosa L, transmarina XXXVIII; de vino Opimiano; notabilia circa apothecas: de natura vini; vini salsi genera VII. de passo et hepsemate et dulcium generibus XVII. (xii) Secundari vini genera III. (xiii–xvii) Quam nuper coeperint vina generosa in Italia; de vino observationes a Romulo rege; quibus vinis usi antiqui; quando primum vini quattuor genera posita. (xviii–xxi) Ex labrusca usus V; qui frigidissimus natura sucus; vini fictici genera LXVI: hydromeli sive apomeli sive melicraton; oxymeli. (xxii–v) Vini prodigiosi genera XII;

Authorities: Marcus Varro, Mucianus, Virgil, Fabianus, Sebosus, Pomponius Mela, Flavius Procilius, Hyginus, Trogus, Claudius Caesar, Cornelius Nepos, Sextus Niger's Greek treatise *On Medicine*, Cassius Hemina, Lucius Piso, Tuditanus, Antias. Foreign authorities: Theophrastus, Herodotus, Callisthenes, Isogonus, Clitarchus, Anaximenes, Duris, Nearchus, Onesicritus, Polycritus, Olympiodorus, Diognetus, Nicobulus, Anticlides, Chares of Mitylene, Menaechmus, Dorotheus of Athens, Lycus, Antaeus, Ephippus, Dinon, Adimantus, Ptolemy son of Lagus, Marsyas of Macedon, Zoilus *ditto*, Democritus, Amphilochus, Aristomachus, Alexander the Learned, Juba, Apollodorus *On Scents*; the following medical writers—Heraclides, Botrys, Archedemus, Dionysius, Democedes, Euphron, Mnesides, Diagoras, Iollas; Heraclides of Tarentum, Xenophon of Ephesus.

Book XIV. Contents: fruit-trees. (i–v) Vines, their nature; their ways of bearing; grapes, their nature and tending; 91 kinds of vines and grapes; viticulture and vineyards, noteworthy facts as to (vi–xi) Mead, its discovery; 50 wines of quality; 38 foreign vintages; Opimian wine; wine-cellars, notable facts as to; nature of wine; salt wine, 7 kinds; raisin-wine, must, sweet wine, 17 kinds. (xii) Inferior wines, 3 kinds. (xiii–xvii) Wines of quality, how recently begun to be made in Italy; remarks as to wine from reign of Romulus onwards; wines used in early periods; four kinds of wine, when first established. (xviii–xxi) Wild vine, 5 uses of; what juice by nature the coldest; artificial wine, 66 kinds; mead or honey-wine or water-mead; vinegar-honey. (xxii–v) Remarkable wines, 12 kinds;

quibus vinis ad sacra uti fas non sit; quibus generibus musta condiant, de pice, resinis. (xxvi f.) De vasis vinariis, de aceto, de faece, de cellis. (xxviii f.) De ebrietate; ex aqua et frugibus vini vim fieri. Summa: res et historiae et observationes DX.

Ex auctoribus: Cornelio Valeriano, Vergilio, Celso, Catone censorio, Sasernis patre et filio, Scrofa, M. Varrone, D. Silano, Fabio Pictore, Trogo, Hygino, Flacco Verrio, Graecino, Attico Iulio, Columella, Masurio Sabino, Fenestella, Tergilla, Maccio Plauto, Fabio Dossenno, Scaevola, L. Aelio, Ateio Capitone, Cotta Messalino, L. Pisone, Pompeio Lenaeo, Fabiano, Sextio Nigro, Vibio Rufino. Externis: Hesiodo, Theophrasto, Aristotele, Democrito, Hierone rege, Attalo rege, Philometore rege, Archyta, Xenophonte, Amphilocho Athenaeo, Anaxipoli Thasio, Apollodoro Lemnio, Aristophane Milesio, Antigono Cymaeo, Agathocle Chio, Apollonio Pergameno, Aristandro Athenaeo, Bacchio Milesio, Bione Solense, Chaerea Atheniense, Chaeristo item, Diodoro Prienaeo, Dinone Colophonio, Epigene Rhodio, Evagone Thasio, Euphronio Athenaeo, Androtione qui de agricultura scripsit, Aeschrione qui item, Lysimacho qui item, Dionysio qui Magonem transtulit, Diophane qui ex Dionysio epitomen fecit, Asclepiade medico, Erasistrato item, Commiade, qui de conditura vini scripsit, Aristomacho qui item, Hicesio qui item, Themisone medico, Onesicrito, Iuba rege.

Libro XV. continentur naturae frugiferarum arborum. (i–viii) De olea: quamdiu apud Graecos tantum fuerit; quando primum in Italia, Hispania, Africa esse coeperit; de oleo nationes et bonitates

wines not permissible to use at sacrifices; substances used to flavour must—pitch, resins. (xxvi f.) Wine-jars, vinegar, lees, cellars. (xxviii f.) Intoxication; drinks made from water and fruit can be as potent as wine. Total: 510 facts, investigations and observations.

Authorities: Cornelius Valerian, Virgil, Celsus, Cato the Censor, Saserna senior, Saserna junior, Scrofa, Marcus Varro, Decius Silanus, Fabius Pictor, Trogus, Hyginus, Verrius Flaccus, Graecinus, Julius Atticus, Columella, Masurius Sabinus, Fenestella, Tergilla, Maccius Plautus, Fabius Dossennus, Scaevola, Lucius Aelius, Ateius Capito, Cotta Messalinus, Lucius Piso, Pompeius Lenaeus, Fabianus, Sextius Niger, Vibius Rufinus. Foreign authorities: Hesiod, Theophrastus, Aristotle, Democritus, King Hiero, King Attalus, King Philometor, Archytas, Xenophon, Amphilochus of Athens, Anaxipolis of Thasos, Apollodorus of Lemnos, Aristophanes of Miletus, Antigonus of Cumae, Agathocles of Chios, Apollonius of Pergamum, Aristander of Athens, Bacchius of Miletus, Bion of Soli, Chaereas of Athens, Chaeristus *ditto*, Diodorus of Priene, Dinon of Colophon, Epigenes of Rhodes, Evagon of Thasos, Euphronius of Athens, Androtion *On Agriculture*, Aeschrion *ditto*, Lysimachus *ditto*, Dionysius's translation of Mago, Diophanes's Epitome of Dionysius, the medical writers Asclepiades and Erasistratus, treatises on *The Making of Wine* by Commiades, Aristomachus and Hicesius, Themiso on medicine, Onesicritus, King Juba.

Book XV. Contents: Fruit-bearing trees, their various natures. (i–viii) The olive tree—how long was it grown only in Greece; when first introduced into Italy, Spain, Africa; olive-oil, its kinds and

olei; quae natura olivae et olei incipientis; olivarum genera XV; de natura olei; cultura olearum; de servandis olivis; quomodo faciendum sit oleum; olei fictici genera XLVIII; cici arbor sive croto sive sili sive sesamon; de amurca. (ix–xxxiv) Pomorum omnium genera et natura: nucum pinearum genera IV; cotoneorum genera IV; struthiorum genera IV; Punicorum genera IX; Persicorum genera VII; prunorum genera XII; de persea; malorum genera XXX; quo quaeque tempore externa poma venerint in Italiam et unde; quae novissime; pirorum genera XLI; de insitorum varietate et fulgurum piatione: de pomis servandis et uvis; ficorum genera XXIX; de ficis historica; de caprificatione; mespilae genera III; sorborum genera IV; nucum genera VIII; castanearum genera XVIII; siliquae; de carnosis pomis; de moris; de unedone; acinorum naturae; bacarum naturae; cerasorum genera VIII; corna; lentisci; sucorum differentiae XIII. (xxxv–viii) Myrtus: historica de myrto; genera eius XI. (xxxix f.) Laurus: genera eius XIII. Summa: res et historiae et observationes DXX.

Ex auctoribus: Fenestella, Fabiano, Vergilio, Cornelio Valeriano, Celso, Catone censorio, Sasernis patre et filio, Scrofa, M. Varrone, D. Silano, Fabio Pictore, Trogo, Hygino, Flacco Verrio, Graecino, Attico Iulio, Columella, Masurio Sabino, Tergilla, Cotta Messalino, L. Pisone, Pompeio Lenaeo, Maccio Plauto, Fabio Dossenno, Scaevola, L. Aelio, Ateio Capitone, Sextio Nigro, Vibio Rufino. Externis: Hesiodo, Theophrasto, Aristotele, Democrito, Hierone rege, Philometore rege, Attalo rege, Archyta, Xenophonte, Amphilocho Athenaeo, Anaxipoli Thasio

valuable properties; nature of the olive and olive-oil when forming; 15 kinds of olives; nature of olive-oil; cultivation of olive-trees; storing of olives; manufacture of olive-oil; 48 kinds of artificial olive-oil; the kiki-tree or croto or sili or sesamum (castor-oil tree); olive-lees. (ix–xxxiv) The varieties of fruit, their kinds and nature: pine-cones, 4 kinds; quinces, 4 kinds; sparrow-apples, 4 kinds; pomegranate, 9 kinds; peach, 7 kinds; plum, 12 kinds; the persea-trea; apple, 30 kinds; foreign apples—dates and sources of introduction into Italy: most recent introduction; pears, 41 kinds; grafting of varieties, and expiation when struck by lightning; storage of fruit and grapes; figs, 29 kinds; researches as to; artificial ripening of; medlars, 3 kinds; service-berry, 4 kinds; nuts, 8 kinds; chestnuts, 18 kinds; carobs; fleshy fruits; mulberries; the arbutus; berries, varieties of; hard fruit, varieties; cherry, 9 kinds; cornel-cherries; mastic-trees; juices, 13 different sorts; (xxxv–viii) the myrtle, researches as to; 11 kinds. (xxxix f.) The bay-tree, 13 kinds. Total: 520 facts, researches and observations.

Authorities: Fenestella, Fabianus, Virgil, Cornelius Valerian, Celsus, Cato the Censor, the Sasernae, senior and junior, Scrofa, Marcus Varro, Decimus Silanus, Fabius Pictor, Trogus, Hyginus, Verrius Flaccus, Graecinus, Julius Atticus, Columella, Masurius Sabinus, Tergilla, Messalinus Cotta, Lucius Piso, Pompeius Lenaeus, Maccius Plautus, Fabius Dossennus, Scaevola, Lucius Aelius, Ateius Capito, Sextius Niger, Vibius Rufinus. Foreign authorities: Hesiod, Theophrastus, Aristotle, Democritus, King Hiero, King Philometor, King Attalus, Archytas, Xenophon, Amphilochus of Athens, Anaxipolis of

Apollodore Lemnio, Aristophane Milesio, Antigono Cymaeo, Agathocle Chio, Apollonio Pergameno, Aristandro Athenaeo, Bacchio Milesio, Bione Solense, Chaerea Athenaeo, Chaeristo item, Diodoro Prienaeo, Dinone Colophonio, Epigene Rhodio, Euagone Thasio, Euphronio Athenaeo, Androtione qui de agricultura scripsit, Aeschrione qui item, Dionysio qui Magonem transtulit, Diophane qui ex Dionysio epitomen fecit, Asclepiade medico, Erasistrato item, Commiade qui de conditura vini, Aristomacho qui item, Hicesio qui item, Themisone medico, Onesicrito, Iuba rege.

Libro XVI. continentur silvestrium arborum naturae. (i f.) Gentes sine arbore; miracula in septentrionali regione arborum. (iii–xiii) De glandiferis: de civica corona; de coronarum origine; qui frondea corona donati; glandium genera XIII; de fago; de reliquis glandiferis [1]; de carbone; de galla; quam multa praeter glandem ferant eaedem arbores: cachrys, coccum, agaricum. (xiv) Quarum arborum cortices in usu. (xv–xx) De scandulis: de pinu, pinastro, picea, abiete, larice, taeda, taxo. (xxi–iii) Quibus modis fiat pix liquida; quomodo cedrium fiat; quibus modis spissa pix fiat, quibus coquatur resina; zopissa. (xxiv–ix) Quarum arborum materiae in pretio: fraxini genera IV; tiliae genera II; aceris genera X; bruscum, molluscum; staphylodendron; buxi genera III; ulmorum genera IV. (xxx f.) Arborum natura per situs: quae montanae, quae campestres, quae siccaneae, quae aquaticae, quae communes. (xxxii) Divisio generum. (xxxiii–viii) Quibus folia non decidant: de rhododendro; quibus non omnia folia cadant; quibus in locis nulli arborum;

[1] *Rackham*: glandibus.

Thasos, Apollodorus of Lemnos, Aristophanes of Miletus, Antigonus of Cumae, Agathocles of Chios, Apollonius of Pergamum, Aristander of Athens, Bacchius of Miletus, Bion of Soli, Chaereas of Athens, Chaeristus *ditto*, Diodorus of Priene, Dinon of Colophon, Epigenes of Rhodes, Evagon of Thasos, Euphronius of Athens, Androtion *On Agriculture*, Aeschrion *ditto*, Dionysius's translation of Mago, Diophanes's summary of Dionysius, Asclepiades the physician, Erasistratus *ditto*, Commiades *On Making Wine*, Aristomachus *ditto*, Hicesius *ditto*, Onesicritus, King Juba.

Book XVI. Contents: forest trees, their various natures. (i f.) Races that have no trees; remarkable trees in the North. (iii–xiii) Acorn-bearing trees: the civic wreath; origin of wreaths; wreath of foliage, on whom bestowed; 13 kinds of acorns; the beech; the other acorn-bearing trees; charcoal; the oak-apple; how many fruits beside the acorn borne by the same trees; catkin, cochineal-berry, larch-fungus. (xiv) Trees whose bark is utilized. (xv–xx) Roof-shingles: stone-pine, wild pine, spruce, silver-fir, larch, pitch-pine, yew. (xxi–iii) Liquid pitch, methods of making; cedar-oil, methods of making; wax-pitch, methods of making; resin, methods of boiling; thick-pitch. (xxiv–ix) Trees of value for timber: ash, 4 kinds; lime, 2 kinds; maple, 10 kinds; growth on the maple, maple-fungus; pistachio tree; box, 3 kinds; elm, 4 kinds. (xxx f.) Nature of trees classified by habitat: those that grow on mountains, on plains, on dry soils, in water, in several habitats. (xxxii) Classification. (xxxiii–viii) Non-deciduous trees: rhododendron; partially deciduous trees; regions where all trees evergreen; nature of deciduous foliage;

de natura foliorum cadentium; quibus foliorum varii colores: populorum genera III; quorum foliorum figura mutetur; quae folia versentur omnibus annis; foliorum e palmis cura et usus; foliorum mirabilia. (xxxix) Ordo naturae in satis. (xl) Quae arbores numquam floreant: de iuniperis. (xli–l) De conceptu arborum, de germinatione, de partu; quo ordine floreant, de cornu, quo quaeque tempore ferant; anniferae, in triennium ferentes, quae fructum non ferant; quae infelices existimentur; quae facillime perdant fructum aut florem; quae ubi non ferant; quomodo quaeque ferant; quibus fructus ante quam folium nascatur; biferae, triferae. (li) Quae celerrime senescant, quae tardissime; praecoces fructus, serotini. (lii) In quibus plura rerum genera gignantur; crataegum. (liii–vi) differentiae arborum per corpora et ramos; lotos sive faba Graeca. de ramis, cortice, radicibus. (lvii f.) Arbores quae sponte resurrexerint; quibus modis sponte nascantur arbores. (lix–lxi) Naturae differentiae non omnia ubique generantis; ubi quae non nascantur; de cupressis; nasci saepe ex terra quae ante nata non sint. (lxii f.) De hedera: genera eius XX. smilax. (lxiv–lxxi) De aquaticis: de calamis; harundinum genera XXVIII; de sagittaris et scriptoris et fistulatoris calamis; Orchomenia harundine et aucupatoria et piscatoria; de vinitoria harundine; de alno; de salice, genera eius VII; quae praeter salicem ad ligandum utilia; de scirpis, candelis, cannis, tegulo; de sabucis, de rubis. (lxxii f.) De arborum sucis. (lxxiv–vii) De natura materiarum; de arboribus caedendis; de magnitudine arborum; de sapino;

trees whose foliage changes colour: poplars, 3 kinds; foliage that changes shape of leaf; foliage that yearly turns round; palm-leaves, cultivation and use of; remarkable foliage. (xxxix) Process of growth in trees grown from seed. (xl) Non-flowering trees: the junipers. (xli–l) Conception, germination and parturition of trees; order of flowering; the husk; date of bearing of the various kinds, trees that bear yearly, three-yearly; trees that do not bear fruit; trees believed unlucky; trees that lose fruit or flower most easily; which kinds do not bear in which places; method of bearing of the various kinds; kinds that bear fruit before foliage; kinds that bear twice a year, thrice a year. (li) Which age most rapidly, which least rapidly; early ripening and late ripening fruits. (lii) Which kinds have products of more than one sort: the kernel of the box. (liii–vi) Differences of trees in trunks and boughs: the lotus or date plum; boughs, bark, roots. (lvii f.) Instances of trees rising again of their own accord; spontaneous generation of trees, modes of. (lix–lxi) Differences of nature not generating all kinds everywhere; places where particular kinds do not grow; cypresses; growth from the earth of entirely novel kinds a frequent occurrence. (lxii) Ivy, its 20 kinds. (lxiii) Bindweed. (lxiv–lxxi) Water plants: canes; reeds, 28 kinds; reed arrows, reed pens, reed pipes; the bird-catcher's and fisherman's reed of Orchomenus; the vine-prop reed; the alder; the willow, its 7 kinds; other plants useful for ties; bulrushes, rushlights, canes, thatch; elders, brambles. (lxxi f.) Sap of trees. (lxxiv–vii) Nature of timbers; wood-cutting; sizes of trees; the pine; charcoal. (lxxviii–

igniaria e ligno. (lxxviii–lxxxi) Quae cariem non sentiant, quae rimam; historica de perpetuitate materiarum; teredinum genera; de materiis architectonica. (lxxxii–iv) De materiis fabrilia; de glutinanda materia; de lamnis sectilibus. (lxxxv–xc) Arborum durantium vetustas: ab Africano priore sata; in urbe Roma D annorum arbor; ab urbe condita arbores; vetustiores urbe in suburbanis; ab Agamemnone satae arbores; a primo anno belli Troiani arbores; ab Ili appellatione arbores apud Troiam antiquiores bello Troiano; item Argis; ab Hercule satae; ab Apolline satae: arbor antiquior quam Athenae; quae genera arborum minume durent. (xci–iv) Arbores ex eventu nobiles; quae sedem nascendi suam non habeant; quae in arboribus vivant et in terra nasci possint, genera earum IX; cadytas, hyphear, stelis, hippophaeston; de visci et similium natura; de visco faciendo. Summa: res et historiae et observationes MCXXXV.

Ex auctoribus: M. Varrone, Fetiale, Nigidio, Cornelio Nepote, Hygino, Masurio, Catone, Muciano, L. Pisone, Trogo, Calpurnio Basso, Cremutio, Sextio Nigro, Cornelio Boccho, Vitruvio, Graecino. Externis: Alexandro polyhistore, Hesiodo, Theophrasto, Democrito, Homero, Timaeo mathematico.

Libro XVII. continentur sativarum arborum naturae. (i) Arborum pretia mirabilia. (ii–iv) Caeli natura ad arbores; quam partem caeli spectare vineae debeant; qualis terra optima; de terra qua Graeci et Galliae laetant genera VIII. (v–viii) De cineris usu; de fimo; quae sata uberiorem terram faciant, quae urant; quibus modis fimo utendum. (ix–xxi) Quibus modis arbores serantur; semine

lxxxi) Trees exempt from rot—from splitting; researches as to durability of timbers; kinds of woodworms; wooden architecture. (lxxxii–iv) Wooden tools; gluing timber; sawn sheets of wood. (lxxxv–xc) Age of long-lived trees: tree planted by the elder Africanus; tree in Rome 500 years old; trees dating from the foundation of the city; trees in the suburbs older than the city; trees planted by Agamemnon; trees dating from first year of the Trojan War; trees at Troy shown from designation 'Ilion' to be older than the Trojan War; *ditto* at Argos; trees planted by Hercules; trees planted by Apollo; a tree older than Athens; what kinds of trees are least long-lived. (xci–iv) Trees celebrated for some occurrence; parasitic plants; plants parasitic on trees and able to grow in earth—9 kinds of these; cadytas, hyphear, stelis, hippophaestum; nature of mistletoe and similar plants; manufacture of bird-lime. Total: 1135 facts, researches and observations.

Authorities: Marcus Varro, Fetialis, Nigidius, Cornelius Nepos, Hyginus, Masurius, Cato, Mucianus, Lucius Piso, Trogus, Calpurnius Bassus, Cremutius, Sextius Niger, Cornelius Bocchus, Vitruvius, Graecinus. Foreign authorities: Alexander the Learned, Hesiod, Theophrastus, Democritus, Homer, Timaeus the mathematician.

Book XVII. Contents: the natures of cultivated trees. (i) Remarkable prices for trees. (ii–iv) Effect of climate on trees; proper aspect for vines; best soil; soil enjoyed by Greece and the Gallic provinces—8 kinds. (v–viii) The use of ashes; dung; what crops enrich the soil, which empoverish it; methods of using manure. (ix-xxi) Methods of growing trees; kinds springing from seed;

nascentia; quae numquam degenerent; plantis nascentia, avolsione nascentia, surculo; de seminaris, de transferendis seminaris; de ulmis serendis; de scrobibus; de intervallis arborum; de umbra; de stillicidis; quae tarde crescant, quae celeriter; propagine nascentia. (xxii–viii) De insitione quomodo inventa sit; genera insitionum; inoculatio; emplastratio; de vite inserenda; ramo nascentia; quae taleis et quomodo serantur. (xxix–xxxi) Olearum cultura, operum surcularium per tempora anni digestio; de ablaqueandis et adcumulandis. (xxxii–iv) De salicto; harundineta; de ceteris ad perticas et palos caeduis. (xxxv f.) Vinearum ratio et arbustorum; ne uvae ab animalibus infestentur. (xxxvii f.) Morbi arborum; prodigia ex arboribus. (xxxix–xlvii) Medicinae arborum; quomodo rigandum; mirabilia de riguis; de stercoratione; quomodo circumfodiendum; castratio arborum; caprificatio; quae putationis vitia; arboribus medicamenta. Summa: res et historiae et observationes MCCCLXXX.

Ex auctoribus: Cornelio Nepote, Catone censorio, M. Varrone, Celso, Vergilio, Hygino, Sasernis patre et filio, Scrofa, Calpurnio Basso, Trogo, Aemilio Macro, Graecino, Columella, Attico Iulio, Fabiano, Mamilio Sura, Dessio Mundo, C. Epidio, L. Pisone. Externis: Hesiodo, Theophrasto, Aristotele, Democrito, Theopompo, Hierone rege, Philometore rege, Attalo rege, Archyta, Xenophonte, Amphilocho Atheniense, Anaxipoli Thasio, Apollodoro Lemnio, Aristophane Milesio, Antigono Cumaeo, Agathocle

that never degenerate; kinds springing from settings, from a cutting, from a layer; seed-beds, transference of seed-beds; growing elms from seed; trenching; distances between trees; shade; droppings from leaves; slow-growing and quick-growing kinds; kinds springing from layers. (xxii–viii) Grafting—how discovered; kinds of grafts; eye-grafting; budding; grafting of vines; grafts growing from boughs; kinds grafted by cuttings, and method. (xxix–xxi) Olive-growing; seasonal arrangement of propagating; trenching round and banking up vines. (xxxii–iv) The willow thicket; reed bed; other plants cut for poles and stakes. (xxxv f.) Arrangement of vineyards and plantations; prevention of injury to vines from animals. (xxxvii f.) Diseases of trees; remarkable products from trees. (xxxix–xlvii) Remedies for diseases of trees; method of watering; remarkable facts as to water-meadows; use of dung; method of hoeing round trunk; lopping of trees; how to dig round trees; pruning of trees; effect of gall-insect; mistakes in pruning; medicaments for trees. Total: 1380 facts, researches and observations.

Authorities: Cornelius Nepos, Cato the censor, Marcus Varro, Celsus, Virgil, Hyginus, the Sasernae senior and junior, Scrofa, Calpurnius Bassus, Trogus, Aemilius Macer, Graecinus, Columella, Julius Atticus, Fabianus, Mamilius Sura, Dessius Mundus, Gaius Epidius, Lucius Piso. Foreign authorities: Hesiod, Theophrastus, Aristotle, Democritus, Theopompus, King Hiero, King Philometer, King Attalus, Archytas, Xenophon, Amphilochus of Athens, Anaxipolis of Thasos, Apollodorus of Lemnos, Aristophanes of Miletus, Antigonus of Cumae, Agathocles of Chios,

Chio, Apollonio Pergameno, Bacchio Milesio, Bione Solense, Chaerea Atheniense, Chaeristo item, Diodoro Prienaeo, Dinone Colophonio, Epigene Rhodio, Euagone Thasio, Euphronio Athenaeo, Androtione qui de agricultura scripsit, Aeschrione qui item, Lysimacho qui item, Dionysio qui Magonem transtulit, Diophane qui ex Dionysio epitomen fecit, Aristandro qui de portentis.

Libro XVIII. continentur naturae frugum. (i) Antiquorum studium in agricultura. (ii) Quae prima Romae corona; de spicea corona. (iii) De iugero. (iv) Quotiens et quibus temporibus fuerit summa vilitas annonae. (v) Qui inlustres de agricultura. (vi) Quae observanda in agro parando. (vii) De villarum positione. (viii) Praecepta antiquorum de agro colendo. (ix) Genera frugum. (x–xxix) Naturae per genera frumenti: de farre, tritico, hordeo, polenta, ptisana, trago, amylo, siligine, similagine, arinca sive olyra, semine sive zea; de reliquis in oriente generibus; de pisturis; de sesima, de erysimo sive irione, de hormino, milio, panico; de fermentis; panis faciendi ratio et genera; quando pistorum initium Romae. (xxx–xxxvi) De leguminibus: faba, ciceris genera, faseoli, pisum; de rapis, napis, lupino. (xxxvii–xliii) Pabularia vicia, ervum, silicia, secale sive asia, farrago; de ocimo; ervilia, medica. (xliv f.) De avena; morbi frugum, remedia. (xlvi) Quid in quoque terrae generum debeat seri. (xlvii) Diversitas gentium in sationibus. (xlviii–l) Vomerum genera; ratio arandi; de occando, runcando, sarriendo; de cratitione. (li–liii) De summa fertilitate soli; ratio saepius anno serendi idem arvum; stercoratio. (liv–lxi) Seminum probatio: quantum ex quoque genere frumenti in iugero serendum; de

Apollonius of Pergamum, Bacchius of Miletus, Bion of Soli, Chaereas of Athens, Chaeristus *ditto*, Diodorus of Priene, Dinon of Colophon, Epigenes of Rhodes, Evagon of Thasos, Euphronius of Athens, Androtion *On Agriculture*, Aeschrion *ditto*, Lysimachus *ditto*, Dionysius's translation of Mago, Diophanes's summary of Dionysius, Aristander *On Portents*.

Book XVIII. Contents: crops, their natures. (i) Devotion to agriculture in early times. (ii) The earliest wreath at Rome; the wreath of ears of corn; (iii) The acre. (iv) Number and dates of lowest falls in price of corn. (v) Distinguished authorities on agriculture. (vi) Rules for preparing the ground. (vii) Location of homesteads. (viii) Old authorities on methods of agriculture. (ix) Kinds of grain. (x–xxix) Properties of corn according to kinds; emmer, wheat, barley, pearl-barley; barley-groats; porridge, starch, common wheat, wheat-flour, two grain wheat, seed; the remaining kinds in the east; modes of grinding; sesame, erysimum or irio, clary, species of millet; yeasts; bread, methods of making and kinds of; when bakers began at Rome. (xxx–xxxvi) Leguminous plants: beans, kinds of chick-pea, calavance, pea; turnips, navews, lupin. (xxxvii–xliii) Fodder: vetch, pulse, fenugreek, secale or rye, mixed fodder, basil, bitter vetch; lucerne. (xliv f.) Oats; corn diseases, remedies. (xlvi) Proper crops to sow in various kinds of soil. (xlvii) National differences in methods of sowing. (xlviii–l) Kinds of plough; method of ploughing; harrowing, weeding, hoeing; cross-harrowing. (li–liii) Greatest fertility of soil; method of cropping same field more than once a year; manuring. (liv–lxi) Seed-testing; amount of seed of different

temporibus serendi; digestio siderum in dies et notae terrestres rerum in agro agendarum. (lxii–lxxiv) Quid quoque mense in agro fieri oporteat: de papavere; de faeno, causae sterilitatum; remedia; de messibus, de frumento servando, de vindemia et autumni operibus. (lxxv f.) Lunaris ratio; ventorum ratio. (lxxvii) Limitatio agrorum. (lxxviii–xc) Prognostica: a sole, a luna, stellis, tonitribus, nubibus, ignibus terrestribus, aquis; ab ipsis tempestatibus; ab animalibus aquatilibus, a volucribus, a quadrupedibus. Summa: res et historiae et observationes MMLX.

Ex auctoribus: Masurio Sabino, Cassio Hemina, Verrio Flacco, L. Pisone, Cornelio Celso, Turranio Gracile, D. Silano, M. Varrone, Catone censorio, Scrofa, Sasernis patre et filio, Domitio Calvino, Hygino, Vergilio, Trogo, Ovidio, Graecino, Columella, Tuberone, L. Tarutio qui Graece de astris scripsit, Caesare dictatore qui item, Sergio Paullo, Sabino Fabiano, M. Cicerone, Calpurnio Basso, Ateio Capitone, Mamilio Sura, Accio qui Praxidicam[1] scripsit. Externis: Hesiodo, Theophrasto, Aristotele, Democrito, Hierone rege, Philometore rege, Attalo rege, Archelao rege, Archyta, Xenophonte, Amphilocho Athenaeo, Anaxipoli Thasio, Apollodoro Lemnio, Aristophane Milesio, Antigono Cymaeo, Agathocle Chio, Apollonio Pergameno, Aristandro Athenaeo, Bacchio Milesio, Bione Solense, Chaerea Atheniense, Chaeristo item, Diodoro Prienaeo, Dinone Colophonio, Epigene Rhodio, Euagone Thasio, Euphronio Athenaeo, Androtione qui de agricultura scripsit, Aeschrione qui item,

[1] *Ribbeck:* praxidica *aut* -as.

varieties of corn required per acre; seasons for sowing; position of stars from day to day and earthly signs as to agricultural operations. (lxii–lxxiv) Agricultural operations proper to the several months; poppies; hay; causes of various kinds of infertility; remedies; harvests, storage of corn, vintage and autumn operations. (lxxv f.) Conditions of the moon, of the winds. (lxxvii) Fixing of bounds of estates. (lxxviii–xc) Weather-forecasts: from the sun, moon, stars, thunder-clouds, mists, earth-fires, waters; from the seasons themselves; from aquatic animals, from birds, from quadrupeds. Total: 2060 facts, researches and observations.

Authorities: Masurius Sabinus, Cassius Hemina, Verrius Flaccus, Lucius Piso, Cornelius Celsus, Turranius Gracilis, Decimus Silanus, Marcus Varro, Cato the ex-Censor, Scrofa, the Sasernae senior and junior, Domitius Calvinus, Hyginus, Virgil, Trogus, Ovid, Graecinus, Columella, Tubero, Lucius Tarutius's Greek treatise *On the Stars*, Caesar the Dictator *ditto*, Sergius Paullus, Sabinus Fabianus, Marcus Cicero, Calpurnius Bassus, Ateius Capito, Mamilius Sura, Accius's *Praxidica.* Foreign authorities: Hesiod, Theophrastus, Aristotle, Democritus, King Hiero, King Philometer, King Attalus, King Archelaus, Archytas, Xenophon, Amphilochus of Athens, Anaxipolis of Thasos, Apollodorus of Lemnos, Aristophanes of Miletus, Antigonus of Cumae, Agathocles of Chios, Apollonius of Pergamos, Aristander of Athens, Bacchius of Miletus, Bion of Soli, Chaereas of Athens, Chaeristus *ditto*, Diodorus of Priene, Dinon of Colophon, Epigenes of Rhodes, Evagon of Thasos, Euphronius of Athens, Androtion *On Agriculture*, Aeschrio *ditto*, Lysimachus *ditto*,

Lysimacho qui item, Dionysio qui Magonem transtulit, Diophane qui ex Dionysio epitomen fecit, Thalete, Eudoxo, Philippo, Calippo, Dositheo, Parmenisco, Metone, Critone, Oenopide, Conone, Euctemone, Harpalo, Hecataeo, Anaximandro, Sosigene, Hipparcho, Arato, Zoroastre, Archibio.

Libro XIX. continentur (i–vi) Lini natura et miracula; genera eius excellentia XXVII; quomodo seratur et perficiatur; quando primum in theatris vela. (vii–ix) De sparti natura: quomodo perficiatur, quando primus usus eius. (x) De eriophoro bulbo. (xi–xviii) Quae sine radice nascantur et vivant; quae nascantur et seri non possint: misy, iton, geranion; de tuberibus; pezicae: de laserpicio et lasere: maspetum, magydaris; de rubia; de radicula. (xix–xxi) Hortorum gratia; digestio terra enascentium praeter fruges et frutices. (xxii–xxxvii) Natura et genera et historiae nascentium in hortis rerum XX: de omnium earum radicibus, floribus, foliis; quibus hortensiorum folia cadant; quoto quaeque die nascantur; seminum natura; quomodo quaeque serantur; quorum singula genera, quorum plura sint. (xxxviii–lv) Natura et genera et historiae ad condimenta in horto satarum rerum XXIII. (xlviii) Lacrima nascentia. (lvi) Ferulacea genera iv; cannabis. (lvii–lix) Morbi hortensiorum; remedia: quibus modis formicae necentur; contra urucas remedia, contra culices; quibus salsae aquae prosint. (lx) Ratio rigandi hortos. (lxi–ii) De sucis et saporibus hortensiorum; de piperitide et libanotide et zmyrnio. Summa: res et historiae et observationes MCXLIV.

Ex auctoribus: Maccio Plauto, M. Varrone, D. Silano, Catone censorio, Hygino, Vergilio, Muciano, Celso, Columella, Calpurnio Basso, Mamilio Sura,

Dionysius's translation of Mago, Diophanes's summary of Dionysius, Thales, Eudoxus, Philip, Calippus, Dositheus, Parmeniscus, Meto, Crito, Oenopides, Conon, Euctemon, Harpalus, Hecataeus, Anaximander, Sosigenes, Hipparchus, Aratus, Zoroaster, Archibius.

Book XIX. Contents: (i–vi) Flax, nature and remarkable properties of; 27 specially good kinds of; how grown and how made up; earliest employment of awnings in the theatre. (vii–ix) Esparto grass, nature of; how made up; when first used. (x) The wool-bearing bulb. (xi–xviii) Plants that spring up and live without root; plants that spring up and cannot be grown from seed: mushroom, iton, stork's bill; truffles, stalkless mushrooms; silphium plant, and its juice, leaf and stalk; madder; dyers' rocket, (xix–xxi) The charm of gardens; description of plants other than cereals and shrubs. (xxii–xxxvii) Nature and kinds and descriptions of 20 garden plants: roots, flowers, leaves of all these; deciduous garden plants; various periods of sprouting; nature of seeds; various modes of sowing; which of a single kind and which of several kinds. (xxxviii–lv) Nature and kinds and descriptions of 23 garden plants cultivated for condiments. (xlviii) Plants springing from an exudation; (lvi) Fennel-giant, 4 kinds; hemp. (lvii–lix) Diseases of garden plants; cures; modes of killing ants; modes of protecting against caterpillars, against green-fly; what plants benefited by salt water. (lx) Method of watering gardens. (lxi f.) Juices and flavours of garden plants; pepperwort, rosemary, mint. Total 1144 facts, investigations and observations.

Authorities: Maccius Plautus, Marcus Varro, Decimus Silanus, Cato the Censor, Hyginus, Virgil, Mucianus, Celsus, Columella, Calpurnius Bassus,

Sabino Tirone, Licinio Macro, Q. Birrio, Vibio Rufino, Caesennio qui κηπουρικὰ scripsit, Castritio item, Firmo item, Potito item. Externis: Herodoto, Theophrasto, Democrito, Aristomacho, Menandro qui βιόχρηστα scripsit, Anaxilao.

Libro XX. continentur medicinae ex his quae in hortis seruntur: (ii) cucumere silvestri XXVI, (iii) elaterio XXVII, (iv) anguino cucumere sive erratico V, (v) cucumere sativo IX, (vi) pepone XI, (vii) cucurbita sive sompho I, (viii) colocynthide X, (ix) rapis IX, (x) rapo silvestri I, (xi) napis sive bunio sive buniade V, (xii–xiii) raphano sativo XLIII, armoracia I, (xiv) pastinaca V, hibisco sive plistolochia sive moloche agria XI, (xv) staphylino sive pastinaca erratica XXII, (xvi) gingidio I, (xvii) sisere XI, (xviii) sile XII, (xix) inula XI, (xx) caepa XXVII (xxi) porro sectivo XXXII, (xxii) porro capitato XXXIX, (xxiii) alio LXI, (xxiv) lactuca XLII, caprina IV, (xxv) caesapo I, isati I, lactuca silvatica VII, (xxvi) hieracia XVII, (xxvii) beta XXIV, (xxviii) limonio sive neuroide III, (xxix) intubo, quae ambubeia, IV, (xxx) cichorio sive chresto sive pancratio XII, (xxxi) hedypnoide IV, (xxxii) seris generibus II, medicinae VII, (xxxiii) brassica LXXXVII, (xxxv) cyma, (xxxvi) brassica silvestri XXVII, (xxxvii) lapsana I, (xxxviii) marina brassica I, (xxxix) scilla XXIII, (xl) bulbis XXX, (xli) bulbine I, bulbo vomitorio, (xlii f.) asparago sativo XVII, corruda sive ormino sive Libyco XXIV, (xliv) apio XVII, (xlv) apiastro sive melissophyllo, (xlvi) olusatro sive hipposelino XI, oreoselino II, heleoselino I, (xlvii) petroselino I, buselino I, (xlviii) ocimo XXXV, (xlix) eruca XII, (l) nasturtio XLII, (li) ruta LXXXIV, (lii) mentastro XX, (liii) menta XLI, (liv) puleio XXV,

Mamilius Sura, Sabinus Tiro, Licinius Macer, Quintus Birrius, Vibius Rufinus, Caesennius *On gardening*, Castritius *ditto*, Firmus *ditto*, Potitus *ditto*. Foreign authorities: Herodotus, Theophrastus, Democritus, Aristomachus, Menander's *Things serviceable for life*, Anaxilaus.

Book XX. Subject: medicines obtained from garden plants: (ii) from the wood-cucumber 26, (iii) wild cucumber 27; (iv) snake cucumber or wild cucumber 5, (v) garden cucumber 9, (vi) pumpkin 11, (vii) gourd or somphus 1, (viii) colocynth 10, (ix) turnips 9, (x) wild turnip 1, (xi) navews or swede of two varieties 5, (xii f.) garden radish 43, horseradish 1, (xiv) parsnip 5, marsh mallow or plistolochia or wild mallow 11, (xv) staphylinus or wild parsnip 22, (xvi) French carrot 1, (xvii) skirwort 11, (xviii) hartwort 12, (xix) elecampane 11, (xx) onion 27, (xxi) cut leek (chives) 32, (xxii) headed leek 39, (xxiii) garlic 61, (xxiv) lettuce 42, goat-lettuce 4, (xxv) caesapum lettuce 1, isatis 1, wild lettuce 7, (xxvi) hawk-weed 17, (xxvii) beet 24, (xxviii) wild beet or neurois 3, (xxix) endive or wild succory 4, (xxx) chicory or worthy or championship 12, (xxxi) scented succory 4, (xxxii) endive 2 kinds, 7 medicines, (xxxiii) cabbage 87, (xxxv) sprouts, (xxxvi) wild cabbage 27, (xxxvii) charlock 1, (xxxviii) sea-cabbage 1. (xxxix) squill 23, (xl) onions 30, (xli) *bulbine* 1, emetic onion, (xlii f.) garden asparagus 17, wild asparagus or orminus or Libyan asparagus 24, (xliv) parsley 17, (xlv) wild parsley or bee-plant; (xlvi) olusatrum or horse-parsley 11, mountain parsley 2, bog parsley 1, (xlvii) rock parsley 1, cow-parsley 1, (xlviii) basil 35, (xlix) colewort 12, (l) cress 42, (li) rue 84, (lii) wild mint 20, (liii) mint 41, (liv) flea-bane 25, (lv) wild

(lv) puleio silvestri XVII, (lvi) nepeta IX, (lvii) cumino XLVIII, cumino silvestri XXVII, (lviii) ammi X, (lix) cappari XVIII, (lx) Ligustico sive panace IV, (lxi–v) cunila bubula V, cunila gallinacea sive origano V, cunilagine VIII, cunila molli III, libanotide III, cunila sativa III, cunila montana VII, (lxvi) piperitide sive siliquastro V, (lxvii–ix) origano oniti sive prasio VI, tragorigano IX, origano Heraclio, gen. III, medicinae XXX, (lxx) lepidio III, (lxxi) git sive melanthio XXIII, (lxxii-iv) aneso sive aniceto LXI, anetho IX, (lxxv) sacopenio sive sagapeno XIII, (lxxvi-lxxx) papavere albo III, papavere nigro VIII (de sopore, de opio, contra potiones quas ἀνωδύνους et πεπτικὰς et ληξιπυρέτους et κοιλιακὰς vocant; meconio I, papavere rhoca II, papavere silvestri ceratiti sive glaucio sive paralio VI, papavere Heraclio sive aphro IV (diacodion), papavere tithymalo sive paralio III, (lxxxi) porcilaca, quae et peplis, XXV, (lxxxii–iv) coriandro XXI, atriplice XIV, malva malope XIII, malva malache I, malva althaea sive plistolochia LIV; (lxxxv f.) lapatho silvestri sive oxalide sive lapatho canterino sive rumice I, hydrolapatho II, hippolapatho VI, oxylapatho IV, lapatho sativo XXI, bulapatho I, (lxxxvii–ix) sinapi, gen. III, medicinae XLIV, adarca XLVIII, marrubio sive prasio sive linostropho sive philopaede sive philochare XXIX, (xc–xcix) serpyllo XVIII, sisymbrio sive Thymbraeo XXIII, lini semine XXX, blito VI, meo Athamantico VII, faeniculo XXII, hippomarathro sive myrsineo V, cannabi IX, ferula VIII, carduo sive scolymo VI. (c) Theriacae conpositio. Summa: medicinae et historiae et observationes MDCVI.

Ex auctoribus: Catone censorio, M. Varrone, Pompeio Lenaeo, C. Valgio, Hygino, Sextio Nigro qui

flea-bane 17, (lvi) cat-mint 9, (lvii) cumin 48, wild cumin 27, (lviii) ammi 10, (lix) caper-bush 18, (lx) lovage or all-heal 4, (lxi) ox-cunila 5, (lxii) cock-cunila or marjoram 5, (lxiii) cunilago 8, (lxiv) soft cunila 3, libanotis 3, (lxv) garden cunila 3, mountain cunila 7, (lxvi) pepperwort or Indian pepper 5, (lxvii–ix) wild marjoram or horehound 6, goat's-thyme 9, Heraclean marjoram, 3 kinds, 30 drugs; (lxx) pepperwort 3, (lxxi) git or cultivated fennel 23, (lxxii–iv) anise or anicetum 61, dill 9, (lxxv) sacopenium or sagapenum 13, (lxxvi–lxxx) white poppy 3, black poppy 8 (narcotic effect, opium, prophylactics called anodynes, peptic drugs, febrifuges and purges); poppy-juice 1, wild poppy 2, wild horned poppy or glaucous or shore poppy 6, Heracles poppy or foam poppy 4 (medicinal poppy-juice), spurge poppy or sea poppy 3, (lxxxi) purslane, also called peplis, 25, (lxxxii–iv) coriander 21, orache 14, varieties of mallow-malope 13, malache 1, althaea or plistolochia 54, (lxxxv f.) wood-sorrel or oxalis or horse-sorrel or dock 1, water sorrel 2, horse-sorrel 6, bitter sorrel 4, cultivated sorrel 21, cow-sorrel 1, (lxxxvii–ix) mustard 3 kinds, 44 drugs, sedge-froth 48, horehound or prasium or flax-twist or lads-love or philochares 29, (xc–xcix) wild thyme 18, wild mint or Thrymbraeum 23, flax-seed 30, blite 6, bear-wort or Athamas 7, fennel 22, horse-fennel or bay-fennel 5, hemp 9, fennel giant 8, edible thistle or cardoon 6. (c) Snake-bite antidote, recipe for.—Total 1606 drugs, investigations and observations.

Authorities: Cato the Censor, Marcus Varro, Pompeius Lenaeus, Gaius Valgius, Hyginus, Sextius Niger's Greek writings, Julius Bassus *ditto*, Celsus,

Graece scripsit, Iulio Basso qui item, Celso, Antonio Castore. Externis: Democrito, Theophrasto, Orpheo, Menandro qui βιόχρηστα scripsit, Pythagora, Nicandro. Medicis: Hippocrate, Chrysippo, Diocle, Ophione, Heraclide, Hicesio, Dionysio, Apollodoro Citiense, Apollodoro Tarentino, Praxagora, Plistonico, Medio, Dieuche, Cleophanto, Philistione, Asclepiade, Crateua, Petronio Diodoto, Iolla, Erasistrato, Diagora, Andrea, Mneside, Epicharmo, Damione, Dalione, Sosimene, Tlepolemo, Metrodoro, Solone, Lyco, Olympiade Thebana, Philino, Petricho, Miccione, Glaucia, Xenocrate.

Libro XXI. continentur naturae florum et coronamentorum. (ii–ix) De strophiolis; serta; qui invenerint miscere flores; quando primum corollae appellatae et quare; quis primum coronas foliis argenteis et aureis dederit; quare corollaria dicta; de lemniscis; quis primum caelaverit eos; quantus honor coronarum apud antiquos fuerit; severitas antiquorum in coronis; quem floribus coronaverit populus Romanus; pactiles coronae; de sutilibus coronis, de nardinis, de Sericis; Cleopatrae reginae factum in coronis. (x–xii, lxxiii–v). De rosa, genera eius XII, medicinae XXXII; lili genera III medicinae XXIII; lacrima nascens; narcissi genera III medicinae XVI. (xiii) Quorum semen tinguatur, ut infecta nascantur. (xiv–xxxvii) Quemadmodum quaeque nascantur, serantur, colantur, sub singulis generibus. violae colores III, (lxxvi) medicinae XVII): luteae genera V, (lxxvi) medicinae X; de caltha; regius flos; bacchar (medicinae XVII); combretum (medicina I); crocum (medicinae XX); ubi optimi flores; qui flores Troianis temporibus in

Antonius Castor, Foreign authorities: Democritus, Theophrastus, Orpheus, Menander's *Things serviceable for life*, Pythagoras, Nicander. Medical writers: Hippocrates, Chrysippus, Diocles, Ophion, Heraclides, Hicesius, Dionysius, Apollodorus of Citium, Apollodorus of Tarentum, Praxagoras, Pleistonicus, Medius, Dieuches, Cleophantus, Philistion, Asclepias, Crateuas, Petronius Diodotus, Iollas, Erasistratus, Diagoras, Andreas, Mnesides, Epicharmus, Damion, Dalion, Sosimenes, Tlepolemus, Metrodorus, Solon, Lycus, Olympias of Thebes, Philinus, Petrichus, Miccio, Glaucias, Xenocrates.

Book XXI. Contents: the natures of flowers and of flowers for garlands. (ii–ix). Of wreaths; garlands; inventors of blending flowers; when first called 'floral crowns,' and why; who first bestowed crowns with silver and gold foliage; why called 'garland-gratuities'; of ribbons—who first reproduced them in carving; high value placed on crowns of honour among the ancients; simplicity of crowns among the ancients; who received a crown bestowed by the nation at Rome; plaited crowns; stitched crowns, nard-crowns, silk crowns; Queen Cleopatra's action with regard to crowns. (x–xii, lxxiii–v). Rose, 12 kinds, 32 drugs; lily, 3 kinds, 23 drugs; plant from an exudation; narcissus, 3 kinds, 16 drugs. (xiii) Flowers grown of special colours by dyeing the the seed. (xiv–xxxvii) Mode of growing from cuttings, from seed, mode of cultivating various flowers, arranged under various kinds; the violet 3 colours (lxxvi, 17 drugs); yellow herb, 5 kinds (lxxvi, 10 drugs); marsh marigold; king flower; cyclamen (17 drugs); rush (1 drug); crocus (lxxxi, 20 drugs); where the best flowers are; what flowers

usu; de natura odorum; Iris (medicinae XLI); saliunca (medicinae III); polium sive teuthrium (medicinae XIX); qui flos alium colorem mane habeat, alium meridie, alium sole occidente; vestium aemulatio cum floribus; amarantus; cyanus (medicinae II); holochrysos (medicinae III); petilium, bellio; chrysocome sive chrysitis (medicinae VI); qui frutices flore coronent, qui folio; melothrum, spiraea, origanum, cneorum sive casia, genera II, melissophyllum sive melittaena (medicinae XXI), melilotos, quae sertula campana sive melilotum (medicinae XII); trifoli genera III (medicinae IV); myophonum. thymi genera III (medicinaeXXVIII); flore nascentia, non semine; conyza; Iovis flos; hemerocalles (medicinae IV); helenium (medicinae); phlox; quae ramis et foliis odorata; habrotonum, (medicinae XXII): adonium, genera II; ipsa se propagantia; leucanthemum medicina I); amaraci genera II (medicinae LX); nyctegreton sive chenamyche sive nyctalops. (xxxviii f.) Quo ordine temporum flores nascantur; anemone coronaria sive phrenion (xciv–ix, medicinae X), oenanthe herba (medicinae VI), melanthium (medicinae XI), heliochrysos (medicinae XI), gladiolus, hyacinthus (medicinae VIII), lychnis (medicinae VII), tiphyon, pothi genera II, orsinae genera II, vincapervinca sive chamaedaphne (xl, medicinae IV); quae semper vireat herba. (xli–ix) Quam longa cuique florum vita. quae propter apes serenda inter flores; cerintha; de pabulo apium; de morbis earum et remediis; de venenato melle et remediis eius, de melle insano, de melle quod muscae non attingunt; de alvariis, de alvis et cura eorum; si famem apes sentiant; de cera facienda; quae optima eius genera; de cera

were in vogue in Trojan times; nature of scents; the iris (41 drugs); wild nard (3 drugs); the hulwort or teuthrium (19 drugs); flowers with different colours in the morning, at midday, and at sunset; floral patterns in dress; amaranth; the corn-flower (2 drugs); the all-gold (3 drugs); the petilium or ox-eye daisy; the goldy-locks or gilt lady (6 drugs); which plants' flowers provide wreaths, which plants' leaves; white byrony, privet, wild marjoram, mezereum or casia, 2 kinds, bee-leaf or balm (21 drugs), melilot, garland of Campania or honey-lotus (12 drugs); trefoil, 3 kinds (4 drugs); mouse bane; thyme, 3 kinds (28 drugs); plants springing from flower, not seed; elecampane; flower of Jupiter; martagon-lily (4 drugs); calamint (5 drugs); phlox; plant with scented stalk and leaves: southern-wood (22 drugs); flower of Adonis, 2 kinds; self-fertilizers; leucanthemum (1 drug); marjoram, 2 kinds (60 drugs); wake-by-night or chenamyche or see-by-night. (xxxviii f.) Time-series of birth of flowers; garland anemone or phrenion (xciv–ix 10 drugs); wine-flower grass (6 drugs); cultivated fennel (11 drugs), marigold (11 drugs), gladiolus, hyacinth (8 drugs), lychnis (7 drugs), narcissus, pothos, 2 kinds, crocus, 2 kinds, periwinkle or dwarf laurel (xl, 4 drugs); evergreen grass. (xli–ix) Length of life of various flowers; what kinds among flowers should be cultivated to attract bees; wax-flower; diet of bees; their diseases and remedies; poisonous honey and its remedies; honey that causes madness; honey that flies will not touch; apiaries, hives and care of hives; do bees feel hunger? manufacture of wax; the best kinds of wax; Car-

Punica. (l–cviii) Sponte nascentium herbarum in quibuscumque gentibus usus, naturae, miracula; fraga, tamnum, ruscum (c, medicinae IV); batis, genera II (ci, medicinae II), pastinaca pratensis, lupus salictarius, colocasia (cii, medicinae II), anthalium sive anticellium sive anthyllium (ciii, medicinae VI), oetum; quae radices nihil supra terram gignant; arachidna, aracos; candryala, hypochoris, caucalis, anthriscum, scandix (eadem tragopogon), parthenium sive leucanthes sive amaracus sive perdicium sive muralis (civ, medicinae VIII), trychnum sive strychnum sive halicacabum sive calitha sive dorycnion sive manicon sive peritton sive neuras sive morio sive moly (cv, medicinae VIII), corchorus (cvi, medicinae VI), aphace, acynopos, epipetron; quae numquam floreant, quae semper; cneci genera IV (cvii, medicinae III). (liv–viii) Aculeati generis herbae (erynge, glycyrriza, tribulus, ononis, pheos sive stoebe, hippophaes, urticae genera IV, laminum, scorpio, acorna sive phonos, leucacanthos. chalceos, cnecos, polyacanthos, onopyxos, helxine, scolymos, chamaeleon, tetralix (acanthice mastiche, cactus, pternica, pappum, ascalia). (lix) Herbarum genera per caules: coronopus, anchusa, anthemis, phyllanthes, crepis, lotos. (lx) Differentiae herbarum per folia: quibus folia non cadant; quae particulatim floreant; heliotropium, adiantum; herbae quarum medicinae sequenti libro dicentur. (lxi–v) Spicatarum genera: stanyops, alopecuros, stelephuros sive ortyx sive plantago, thryallis; perdicium, ornithogale; post annum nascentes, a summo florentes, item ab imo; lappa herba quae intra se parit, opuntia e folio

thaginian wax. (l–cviii) Self-grown vegetation, its use among certain races, its kinds, remarkable cases of; strawberries, wild grapes, butcher's broom (c, 4 drugs); samphire, 2 kinds (ci, 11 drugs), meadow parsnip, willow-hop, culcas (cii, 2 drugs) Cretan pitch plant, anthalium or anticellium or anthyllium (ciii, 6 drugs); oetum; roots with no growth above the surface of the earth; chickling vetch, aracos; candryala, hypochoeris, caucalis, anthriscum, chervil (also called goat's beard), maiden-flower or white blossom or marjoram or partridge-plant or wall-plant (civ, 8 drugs), nightshade or strychnos or halicacabus or calitha or dorycnion or mad-plant or surplus or sinew-plant or lack-wit or moly (cv, 8 drugs), wild pulse (cvi, 6 drugs), chick-pea, acynopus, rock-plant; non-flowering plants, plants perpetually in flower; safflower, 4 kinds (cvii, 3 drugs). (liv–viii) Plants of the prickly kind (erynge thistle, licorice root, land caltrop, rest-harrow, pheos or stoebe, horse-beam, nettle, 4 kinds, dead-nettle, scorpion-grass, acorna or murder-thistle, whitethorn, copper-wort, safflower, many-thorn, donkey-box, helxine, edible thistle, carline thistle, tetralix heath (thorny mastix, cactus, pternica, pappum, artichoke). (lix) Plants classed by stalks: hartshorn, alkanet, chamomile, phyllanthes, crepis, lotus. (lx) Plants distinguished by leaves: evergreens; plants flowering in sections; heliotrope, maidenhair; plants whose use for drugs will be stated in the next Book. (lxi–v) Ear-bearing classes: stanyops, fox-tail, stelephuros, or quail-plant or plantain, thryallis, partridge-wort, bird's milk; plants of twelve-month growth, plants flowering from top, *ditto* from bottom; internal-sprouting burdock, Opus-plant making root from

radicem faciens; iasione, chondrylla, picris quae toto anno floret. (lxvi) Quibus flos antequam caules exeant, quibus caulis antequam flos, quae ter floreant. (lxvii–lxxi) Cypiros, medicinae VIII; Thesium; asphodelus sive hastula regia (anthericus sive albucum); iunci genera VI, medicinae IV, cyperus, medicinae XIV, cyperis, cypira; holoschoenos. (lxxii) Medicinae ex iunco odorato sive teuchite X, (lxxviii–lxxxii) medicinae ex asaro VIII, medicinae ex Gallico nardo VIII, medicinae ex herba quam phu vocant IV; (lxxxii) Syrium crocomagma, medicinae II. (cviii) pesoluta, medicina I. (cix) Graecorum nominum in ponderibus et mensuris interpretatio. Summa: medicinae et historiae et observationes DCCXXX.

Ex auctoribus: Catone censorio, M. Varrone, Masurio, Antiate, Caepione, Vestino, Vibio Rufino, Hygino, Pomponio Mela, Pompeio Lenaeo, Cornelio Celso, Calpurnio Basso, C. Valgio, Licinio Macro, Sextio Nigro qui Graece scripsit, Iulio Basso qui item, Antonio Castore. Externis: Theophrasto, Democrito, Orpheo, Pythagora, Magone, Menandro qui βιόχρηστα scripsit, Nicandro, Homero, Hesiodo, Musaeo, Sophocle, Anaxilao. Medicis: Mnesitheo qui de coronis, Callimacho qui item, Phania physico, Simo, Timaristo, Hippocrate, Chrysippo, Diocle, Ophione, Heraclide, Hicesio, Dionysio, Apollodoro Citiense, Apollodoro Tarentino, Praxagora, Plistonico, Medio, Dieuche, Cleophanto, Philistione, Asclepiade, Crateua, Petronio Diodoto, Iolla, Erasistrato, Diagora, Andrea, Mneside, Epicharmo, Damione, Dalione, Sosimene, Tlepolemo, Metrodoro, Solone, Lyco, Olympiade Thebana, Philino, Petricho, Miccione, Glaucia, Xenocrate.

Libro XXII. continetur auctoritas herbarum.

leaf; iasione, chondrilla, year-long flowering bitter-plant. (lxvi) Plants producing flower before stalk, stalk before flowers, thrice-flowering. (lxvii–lxxi) Gladiolus, 8 drugs; corydalis; asphodel or royal spear-grass (asphodel-stalk or bulb); rush, 6 kinds, 4 drugs; cyperus, 4 drugs, cyperis, cypira, holoschoenos. (lxxii) Drugs from scented rush or teuchites 10. (lxxviii–lxxxii) Drugs from hazelwort 8, drugs from Gallic nard 8, drugs from 'phu' grass 4; Syrian saffron-leas, 2 drugs, (cviii) pesoluta, 1 drug. (cix) Translation of Greek terms for weights and measures. Total, 730 drugs, investigations and observations.

Authorities: Cato the ex-Censor, Marcus Varro, Masurius, Antias, Caepio, Vestinus, Vibius Rufinus, Hyginus, Pomponius Mela, Pompeius Lenaeus, Cornelius Celsus, Calpurnius Bassus, Gaius Valgius, Licinius Macer, Sextius Niger's Greek treatise, Julius Bassus's *ditto*, Antonius Castor. Foreign authorities: Theophrastus, Democritus, Orpheus, Pythagoras, Mago, Menander's *Things serviceable for life*, Nicander, Homer, Hesiod, Musaeus, Sophocles, Anaxilaus. Medical writers: Mnesitheus *On Wreaths*, Callimachus *ditto*, Phanias the natural scientist, Simus, Timaristus, Hippocrates, Chrysippus, Diocles, Ophion, Heraclides, Hicesius, Dionysius, Apollodorus of Citium, Apollodorus of Tarentum, Praxagoras, Plistonicus, Medius, Dieuches, Cleophantus, Philistio, Asclepias, Crateuas, Petronius Diodotus, Iollas, Erasistratus, Diagoras Andreas, Mnesides, Epicharmus, Damio, Dalio, Sosimenes, Tlepolemus, Metrodorus, Solon, Lycus, Olympias of Thebes, Philinus, Petrichus, Miccio, Glaucias, Xenocrates.

Book XXII. Contents: the importance of herbs.

(i–vi) Gentes herbis formae gratia uti; herbis infici vestes; item pigmento de oleo chortino; de sagminibus, de verbenis et clarigatione; de corona graminea: de raritate eius, qui soli corona ea donati, qui solus centurio. (vii) Medicinae ex reliquis coronamentis. (viii–xlv) Erynge, sive eryngion sive centum capita XXX; acanos I; glycyrriza sive adipso XV. stomatice I; tribuli genera II, medicinae XII; stoebe sive pheos; hippophaes, genera II, medicinae II; urtica LXI; lamium VII; scorpionis genera II, medicina ; leucacantha sive phyllos sive ischias sive polygonato IV; helxine XII; perdicio sive Parthenio sive siderite, quae urceolaris sive astericum, XI; chamaeleone sive ixia sive ulophyto sive cynozolo, genera II, medicinae XII (mastiche); coronopode, anchusa XIV; pseudoanchusa sive echis sive doris III; onochilo sive archebio sive onocheli sive rhexia sive enchrysa XXX; cuius radices colorem mutent; anthemide sive leucan themide sive leucanthemo sive chamaemelo sive melanthio, genera III, medicinae XI; loto herba IV; lotometra II; heliotropio sive helioscopio sive verrucaria XII, heliotropio sive tricocco sive scorpiuro XIV; adianto sive callitricho sive trichomane sive polytricho sive saxifraga, genera II, medicinae XXVIII, frutex sine radice; picride I, Thesio I; asphodelo LI; halimo XIV; acantho sive paederote sive melamphyllo V; bupleuro V; bupresti I; elaphobosco IX, scandice IX, anthrisco II; iasione IV; caucalide XII; sio XI; sillybo; scolymo sive limonio V; soncho, genera II, medicinae XV; condrio sive condrille III. (xlvi) De boletis: proprietas eorum in nascendo. (xlvii–ix) De fungis: notae venenatorum; medicinae ex his

(i–vi) That nations use herbs because of their beauty; herbs used to dye clothes; dye made of vegetable oil *ditto*; tufts of sacred grass, sacred branches and the ritual of demanding redress; wreath of grass, its rarity, its only recipients, the only centurion recipient. (vii) Drugs made from the remaining sorts of wreaths. (viii–xlv) Erynge or eryngion or hundred-heads, 30; acanos thistle, 1: sweet-root or licorice, 15; mouth-heal, 1: caltrop, 2 kinds, 12 drugs; stoebe or pheos; horse-beam, 2 kinds, 2 drugs; nettle, 61; dead-nettle 7; scorpion-plant, 2 kinds, 1 drug; pellitory or phyllos or sciatica-plant or polygonaton, 4; helxine, 12; pellitory or maiden-herb or iron-wort (the same as pitcher-polish or astericum) 11; chamaeleon-plant or carline thistle or ulophytum or cynozolon, 2 kinds, 12 drugs (gum mastic); hartshorn, alkanet, 14; bastard-bugloss or echis or doris, 3; donkey-lip or archebius or donkey-hoof or rhexia or enchrysa, 30; the plant whose roots make dye; chamomile or white anthemis or earth-apple or fennel-flower, 3 kinds, 11 drugs; lotus grass, 4; lotometra, 2; heliotrope or turnsole or wartwort, 12; heliotrope or three-berry or scorpion's tail, 14; adiantum or maiden-hair or trichomanes or many-hair or saxifrage, 2 kinds, 28 drugs, rootless stem; bitter lettuce 1, corydalis 1; asphodel 51; orach 14; bear's breech or lad's love or black-leaf 5; hare's ear 5, cow-nettle 1; wild parsnip 9; chervil 9; southern chevril 2; bind-weed 4; caucalis 12; bur-parsley 11; sillybus thistle; cardoon or meadow thistle 5; sow-thistle, 2 kinds, 15 drugs; chondrilla 3. (xlvi) Mushrooms: peculiarity in their mode of repoduction. (xlvii–ix) Toadstools: signs of poisonous kinds; 9 drugs

IX; silphio VII; laseri XXXIX. (l–lv) Propoli V, mellis XVI, aquae mulsae XVIII; quare genere ciborum mores quoque mutentur; mulso VI; melitite III; cera VIII. (lvi) Contra conpositiones medicorum. (lvii–lxxvi) Medicinae ex frugibus (siligine I, tritico I, palea II, farre I, furfuribus I, arinca, athera II; farina per genera; medicinae XXIX; polenta VIII; polline V, pulte I, farina chartaria I; alica VI; milio VI; panico IV; sesima VII; sesimoide III, Anticyrico III; hordeo IX, hordeo murino, quam Graeci Phoeniciam; I; ptisana IV, amylo VIII, avena I; pane XXI; faba XVI; lente XVII, φάκῳ ἐπὶ τελμάτων III; elelisphaco sive sphaco, quae salvia, XIII; cicere et cicercula XXIII; ervo XX; lupino XXXV; irone sive erysimo, quod Galli velam, XV; hormino VI). (lxxvii–lxxx) Iolio V, miliaria herba I, bromo I, orobanche sive cynomorio I. (lxxxi f.) Contra leguminum bestiolas. spuma de zytho. Summa: medicinae et historiae et observationes DCCCCVI.

Ex auctoribus iisdem quibus priore libro et praeter eos Chrysermo, Eratosthene, Alcaeo.

Libro XXIII. continentur medicinae ex arboribus cultis: (ii–xxii) vitibus XX; foliis vitium VII, pampinis VII; omphacio vitium XIV; oenanthe XXI; uvis recentibus; uvarum servatarum generibus, medicinae XI; sarmentis uvarum I; nucleis acinorum VI; vinaceis VIII; uva theriace IV, uva passa sive astaphide XIV; astaphide agria sive staphide sive taminia sive pituitaria XII; labrusca sive ampelo agria XII; salicastro XII; vite alba sive ampelo leuce sive staphyle sive melothro sive psilothro sive archezosti sive cedrosti sive mado XXXI; vite nigra sive bryonia sive Chironia sive

obtained from these; silphium 7; assafoetida plant 39. (l–lv) Bee-glue 5, honey 16, hydromel 18; reason for influence of diet on character; mead 6; honey-must, 3; wax, 8. (lvi) Warning against doctors' mixtures. (lvii–lxxvi). Drugs from various grains: common wheat 1, wheat 1, chaff 2, emmer 1, bran 1, arinca, rye-water 2; corresponding varieties of flour; 29 drugs; pearl-barley 8; fine flour, pulse 1, paper flour 1; alica 6; millet 6; Italian millet 4; sesame 7; near-sesame 3, hellebore 3; barley 9, wild barley (Greek 'Phoenician barley') 1; pearl-barley 4; starch 8; oats 1; bread 21; bean 16; lentil 17; marsh-bean 3; elelisphacon or fragrant moss (sage) 13; chick-pea and small chick-pea 23; bitter vetch 20; lupine 35; winter-cress or erysimum (Gallic 'vela') 15; clary 6. (lxxvii–lxxx) Darnel 5, millet grass 1, oats 1, choke-weed or broom-rape 1. (lxxxi f.) Protection against maggots in vegetables. Foam from beer.—Total 906 drugs, investigations and observations.

Authorities as in preceding book, also Chrysermus, Eratosthenes, Alcaeus.

Book XXIII. Contents: drugs obtained from cultivated trees: (ii–xxii) from vines 20; vine-leaves 7; tendrils 7; juice of unripe grape 14; wild vine 21; fresh grapes; varieties of stored grapes, 11 drugs; vine-shoots 1; grape-stones 6; grape-skins 8; treacle-grape 4; dried grape or raisin 14; wild raisin or staves-acre or taminia or phlegm-heal 12; claret-vine or wild vine 12; salicastrum wild vine 12; white grape or ampelos leuke or staphyle or white bryony or psilothrum or archezostis or cedrostis or madon 31; black grape or bryony or

gynacanthe sive apronia XXXV; musto XV; Falerno VI, Albano II, Surrentino III; Setino I, Statano I, Signino I; ceteris vinis LXIV. (xxiii–vi) observationes circa vina LXI: quibus aegris danda, quando danda, quomodo danda; observationes circa ea XCI. (xxvii–xxxiii) Aceto XXVIII, aceto scillino XVII, oxymelite VII, sapa VII, faece vini XII, faece aceti XVII, faece sapae IV. (xxxiv–xxxix) Foliis oleae XXIII; flore IV, olea ipsa VI; olivis albis IV, olivis nigris III; amurca XXI, foliis oleastri XVI, omphacio III. (xl–l) Oenanthino oleo XXVIII; cicino XVI; amygdalino XVI; laurino IX; myrteo XX; chamaemyrsinae sive oxymyrsinae, cupressino, citreo, caryino, Cnidio, lentiscino, balanino; cyprino et cypro ipsa XVI, gleucino I; balsamino V; malobathro V; hyoscyamino II, thermino I, narcissino I, raphanino V, sesamino III, lilino I, Selgitico I, Iguino I; elaeomeli II, pissino II. (li–iii) Palmis IX; palma myrobalano III; palma elate XVII. (liv–lxxxiii) Medicinae ex singulorum generum flore, foliis, fructu, ramis, cortice, suco, ligno, radice, cinere (malorum observationes VI, cotoneorum XXII, struthiorum I; dulcium malorum VI, austerorum IV, citreorum V; Punicorum XXVI; stomatice XIV; cytino VIII balaustio XII. (lxii–lxix) Pirorum observationes XIII; ficorum CXI; caprificorum XLII; erineo herba III, prunis IV, Persicis II, prunis silvestribus II; lichene arborum II; (lxx–lxxv) moris XXXIX; stomatice sive arteriace sive panchrestos IV, cerasis V, mespilis II, sorbis, II, nucibus pineis XIII, amygdalis XXIX. (lxxvi–lxxix) Nucibus Graecis I, iuglandibus XXIX. (antidoto); Abellanis III, pistaciis VIII, castaneis V, siliquis V, corno I, unedonibus. (lxxx–lxxxiii) Lauris

Chiron's plant or gynacanthe or apronia 35; must 15; Falernian 6, Alban 2, Surrentine 3; Setine 1, Statane 1, Signine 1; other wines 64. (xxiii–vi) Observations about wines 61; what invalids to be given them, and when and how; observations on these points 91. (xxvii–xxxiii) Vinegar 28, squill-vinegar 17, vinegar-honey 7, must 7, wine lees 12, vinegar lees 17, must lees 4. (xxxiv–xxxix) Olive leaves 23; olive flowers 4, olive berries 6, white olives 4, black olives 3; olive lees 21, wild olive leaves 16, oil of unripe olives 3. (xl–l) Wild olive oil 28; castor oil 16; almond oil 16; bay oil 9; myrtle oil 20; oil of dwarf myrtle or prickly myrtle (butcher's broom), of cypress, of citrus, nut-oil, Cnidian oil, mastic oil, oil of behen-nut, cyprus oil and cyprus flower 16; oil of must 1; of balsam 5; of betel 5, of henbane 2, of lupine 1, of narcissus 1, of radish 5, of sesame 3, of lily-seed 1, oil of Selga 1, of Iguvium 1; of olive-honey 2, of pitch 2. (li–liii) Palm-oil 9, palm-oil of behen-nut 3, of fir 17. (liv–lxxxiii) Drugs from flower, leaves, fruit, branches, bark, sap, wood, root, ash, of the different sorts of tree; observations as to apple-trees 6, as to quinces 22, as to soapworts 1, sweet apples 6, crab apples 4, citron apples 5, pomegranates 26; lip-salve 14; pomegranate blossom 8, wild pomegranate blossom 12. (lxii–lxix) Observations on pear trees, 13, on figs 111, on wild figs 42; erineus grass 3, plums 4, peaches 2, wild plums 2; tree lichen 2. (lxx–lxxv) Mulberries 39; lip-salve or wind-pipe salve or all-heal 4; cherries 5, medlars 2, service-berries 2, pine-cones 13, almonds 29. (lxxvi–lxxix) Greek nuts 1, walnuts 24 (antidote); filberts 3, pistachios 8, chestnuts 5, caroes 5, cornel-cherry 1, arbutuses. (lxxx–lxxxiii) Bay-trees 69, myrtles 60,

LXIX, myrtis LX, myrtidano XIII, oxymyrsine sive chamaemyrsine sive ruscum VI. Summa: medicinae et historiae et observationes MCCCCXVIII.

Ex auctoribus: C. Valgio, Pompeio Lenaeo, Sextio Nigro qui Graece scripsit, Iulio Basso qui item, Antonio Castore, M. Varrone, Cornelio Celso, Fabiano. Externis: Theophrasto, Democrito, Orpheo, Pythagora, Magone, Menandro qui βιόχρηστα, Nicandro, Homero, Hesiodo, Musaeo, Sophocle, Anaxilao. Medicis: Mnesitheo, Callimacho, Phania physico, Timaristo, Simo, Hippocrate, Chrysippo, Diocle, Ophione, Heraclide, Hicesio, Dionysio, Apollodoro Citiense, Apollodoro Tarentino, Praxagora, Plistonico, Medio, Dieuche, Cleophante, Philistione, Asclepiade, Crateua, Petronio Diodoto, Iolla, Erasistrato, Diagora, Andrea, Mneside, Epicharmo, Damione, Dalione, Sosimene, Tlepolemo, Metrodoro, Solone, Lyco, Olympiade Thebana, Philino, Petricho, Miccione, Glaucia, Xenocrate.

Libro XXIV. continentur medicinae ex arboribus silvestribus: (ii–ix) loto Italica VI, glandibus XIII, cocco ilicis III, galla XXIII, visco XI, pilulis glandiferarum I, cerro VIII, subere II, fago IV. (x–xix) Cupresso XXIII, cedro XIII, cedride X, galbano XXIII, Hammoniaco XXIV, styrace X, spondylio XVII, sphagno sive sphaco sive bryo V, terebintho VI, picea VIII. (xx–xxix) Chamaepity X, pityusa VI, resinis XXII, pice XXXIV, pisselaeo sive palimpissa XVI, pissasphalto II, zopissa I, taeda I, lentisco XXII, platano XXV. (xxx–xxxix) Fraxino V, acere I, populo VIII, ulmo XVI, tilia V, sambuco XV, iunipero XXI, salice XIV, Amerina I, vitice XXXIII, erice I; (xl–xlix) genista V, my-

myrtle-berry wine 13, Prickly myrtle or ground-myrtle or butcher's broom 6. Total 1418 drugs, investigations and observations.

Authorities: Gaius Valgius, Pompeius Lenaeus, Sextius Niger's Greek writings, Julius Bassus's *ditto*, Antonius Castor, Marcus Varro, Cornelius Celsus, Fabianus. Foreign authorities: Theophrastus, Democritus, Orpheus, Pythagoras, Mago, Menander's *Things serviceable for life*, Nicander, Homer, Hesiod, Musaeus, Sophocles, Anaxilaus. Medical writers: Mnesitheus, Callimachus, Phanias's *Natural Science*, Timaristus, Simus, Hippocrates, Chrysippus, Diocles, Ophion, Heraclides, Hicesius, Dionysius, Apollodorus of Citium, Apollodorus of Tarentum. Praxagoras, Plistonicus, Medius, Dieuches, Cleophantes, Philistion, Asclepiades, Crateuas, Petronius Diodotus, Iollas, Erasistratus, Diagoras, Andreas, Mnesides, Epicharmus, Damion, Dalion, Sosimenes, Tlepolemus, Metrodorus, Solon, Lycus, Olympias of Thebes, Philinus, Petrichus, Miccio, Glaucias, Xenocrates.

Book XXIV. Contents: Drugs obtained from forest trees: (ii–ix) Egyptian water-lily 6, acorns 13, holm-oak berry 3, oak-apple 23, mistletoe 11, acorns of glandiferous trees 1, Turkey oak 8, cork 2, beech 4. (x–xix) Cypress 23, cedar 13, cedar-berry 10, galbanum 23, gumtree 24, styrax gumtree 10, bear's-foot 17, sphagnus or sphacus or moss 5, turpentine 6, pitch-pine 8. (xx–xxix) Ground-pine 10, pityusa 6, resin 22, pitch 34, cedar-resin oil or twice-boiled pitch 16, earth-pitch 2, wax-pitch 1, pitch-pine 1, mastic-tree 22, plane 25. (xxx–xxxix) Beech 5, maple 1, poplar 8, elm 16, lime 5, elder 15, juniper 21, willow 14, Amerian apple 1, chaste-tree 33, heath 1. (xl–xlix)

rice quae et tamarica III, virga sanguinea I, brya XXIX, silere III, ligustro VIII, alno I, hederis XXXIX, cistho V, cisso erythrano II, chamaecisso II, milace III, clematide III. (l–lix) Harundine XVIII, papyro charta III, hebeno V, rhododendro I, rhus gen. II, medicinae VIII (stomatice), rhu erythro IX, erythrodano XI, alysso II, radicula sive struthio XIII, apocyno II, rore marino XVIII; (lx–lxix) cachry VI, herba Sabina VII, selagine II, samolo II, cummi XI, spina Arabica, IV, spina alba II, acanthio I, acacia XVIII, aspalatho sive erysisceptro sive adipsatheo sive diaxylo VIII, (lxx–lxxix) spina appendice II, pyracantha I, paliuro X, aquifolia X, taxo I, rubis LI (stomatice), cynosbato III, Idaeo rubo I, rhamni gen. II, medic. V, Lycio XVIII, sarcocolla II, oporice II, (lxxx–lxxxix) trixagine sive chamaedrye sive chamaerope sive Teucria XVI, chamaedaphne V, chamelaea VI, chamaesyce VIII, chamaecisso herba I, chamaeleuce sive farfaro sive farfugio I, chamaepeuce V, chamaecyparisso II, ampelopraso VI, stachye I, clinopodio sive cleopiceto sive zopyrontio sive ocimoide III, clematide centunculo III, clematide sive aetite sive lagine. (xl–xlviii) Clematide Aegyptia sive daphnoide sive polygonoide II, aro XIII, dracunculo II, ari III, millefolio sive myriophyllo VII, pseudobunio IV, myrride sive myrra sive myriza VII, oenobreche III. (xcix–cii) Magica de herbis coracesia et calicia, Minyade sive Corinthia I, aproxi (Pythagoria de recidivis morborum), aglaophotide sive marmaritide, Achaemenide sive hippophobade, theombrotio sive semnio, adamantide, Arianide, theronarca, Aethiopide sive Meroide, ophiusa, thalassaegle sive potamaugide, theangelide, gelotophyllide, hestiateride

Broom 5, myrice, also called tamarisk, 3, golden-rod 1, brya 29, brook-willow 3, privet 8, alder 1, ivies 39, cisthus 5, reddish-ivy 2, ground-ivy 2, yew 3, clematis 3. (l–lix) Reed 18, papyrus reed 3, ebony 5, rhododendron 1, sumach 2 kinds, 8 drugs (mouth-heal), red sumach 9, madder 11, madwort 2, radicula or soapwort 13, dog's-bane 2, rosemary 18. (lx–lxix) Rosemary capsule 6, sabine grass 7, savin-tree 2, brookweed 2, cummin 11, Arabian thorn 4, whitethorn 2, bear's-foot 1, acacia 18, rosewood or erysisceptrum or adipsatheum or diaxylon 8. (lxx–lxxix) Barberry-bush 2, pyracanthus 1, Christ's-thorn 10, holly 10, yew 1, blackberries 51 (mouth-heal), dog-rose 3, Ida bramble 1; buckthorn 2 kinds, 5 drugs; Lycium thorn 18, Persian gum 2, oporice 2. (lxxx–lxxxix) Germander or dwarf oak or chamaerops or Teucrian plant 16; dwarf laurel 5, dwarf olive 6, dwarf fig 8, ground ivy 1, chamaeleuce or colt's-foot or farfugium 1, ground larch 5, ground cypress 2. field-garlic 6, horsemint 1, wild basil or cleopicetum or zopyrontium or ocimoides 3, knotweed clematis 3. clematis or aetis or cimoides. (xl–xlviii) Egyptian clematis or laurel clematis or polygonoides 2, wake-robin 13, tarragon 2, dragon-root 3, milfoil or yarrow 7 bastard-bunion 4, sweet-cicely or myrra or myriza 7 oenobreche 3. (xcix–cii) Sorcery from herbs: coracesia and calicia; Minyad or Corinthian herb 1; aproxis (Pythagorean teachings as to recurrent diseases), aglaophotis or marble-quarry plant. Achaemenis or horse's-mane, theombrotion or semnion, uncrushable herb, Ariana plant, theronarca. Ethiopian plant or herb of Meroe, ophiusa, sea-ray or river-flash, theangelis, gelotophyllis, hestiateris or

sive protomedia sive casignete sive Dionysonymphade, helianthide sive heliocallide, hermesiade, aeschynomene, crocide, oenotheride, anacampserote. (ciii–cix) Eriphia, herba lanaria I, lactoris I, militaris I, stratiotes V, herba de capite statuae I, herba de fluminibus I, lingua herba I, herba de cribro I. (cx–cxx) Herba de fimetis I, herba a canum urina I, rodarum III, impia II, Veneris pecten I, exedum, notia II, philanthropos I, lappa canaria II, tordylon sive syreon III, gramen XVII, dactylos V, fenum Graecum, quae silicia, XXXI. Summa: medicinae et historiae et observationes MCLXXVI.

Ex auctoribus: C. Valgio, Pompeio Lenaeo, Sextio Nigro qui Graece scripsit, Iulio Basso qui item, Antonio Castore, Cornelio Celso. Externis: Theophrasto, Apollodoro, Democrito, Orpheo, Pythagora, Magone, Menandro qui βιόχρηστα, Nicandro, Homero, Hesiodo, Musaeo, Sophocle, Anaxilao. Medicis: Mnesitheo, Callimacho, Phania physico, Timaristo, Simo, Hippocrate, Chrysippo, Diocle, Ophione, Heraclide, Hicesio, Dionysio, Apollodoro Citiense, Apollodoro Tarentino, Praxagora, Plistonico, Medio, Dicuche, Cleophanto, Philistione, Asclepiade, Crateua, Petronio Diodoto, Iolla, Erasistrato, Diagora, Andrea, Mneside, Epicharmo, Damione, Sosimene, Tlepolemo, Metrodoro, Solone, Lyco, Olympiade Thebana, Philino, Petricho, Miccione, Glaucia, Xenocrate.

Libro XXV. continentur naturae herbarum sponte nascentium; auctoritas herbarum. (i–vi) De origine usus earum; qui Latine usus earum scripserint; quando ad Romanos ea notitia pervenerit; qui primi Graecorum de his conposuerint; quare minus exerceantur ea remedia; herbae mirabiliter inventae.

protomedia or casignetes or Dionysonymphas, helianthis or heliocallis, hermesiades, aeschynomenes, crocis, oenetheris, anacampseros. (ciii–cix) Eriphia, wool grass 1, milk-wort 1, soldier-grass 1, stratiotes 5, statue's head grass 1, river grass 1, tongue grass 1, sieve grass 1. (cx–cxx) Dung-hill grass 1, dog's water grass 1, rodarum 3, French everlasting 2, Venus's comb 1, exedum, southern-wood 2, goose-grass 1, dog-bur 2, hart-wort or syreon 3, couch-grass 17, lady's finger 5, Greek hay or fenugreek, our silicia, 31. Total: 1176 drugs, investigations and observations.

Authorities used: Gaius Valgius, Pompeius Lenaeus, Sextius Niger's Greek writings, Julius Bassus's *ditto*, Antonius Castor, Cornelius Celsus. Foreign authorities: Theophrastus, Apollodorus, Democritus, Orpheus, Pythagoras, Mago, Menander's *Things serviceable for life*, Nicander, Homer, Hesiod, Musaeus, Sophocles, Anaxilaus. Medical writers: Mnesitheus, Callimachus, Phanias the scientific writer, Timaristus, Simus, Hippocrates, Chrysippus, Diocles, Ophion, Heraclides, Hicesius, Dionysius, Apollodorus of Citium, Apollodorus of Tarentum, Praxagoras, Plistonicus, Medius, Dieuches, Cleophantus, Philistio, Asclepiades, Crateuas, Petronius Diodotus, Iollas, Erasistratus, Diagoras, Andreas, Mnesides, Epicharmus, Damion, Sosimenes, Tlepolemus, Metrodorus, Solon, Lycus, Olympias of Thebes, Philinus, Petrichus, Miccio, Glaucias, Xenocrates.

Book XXV. Contents: the natures of self-grown plants; value of plants. (i–vi) Origin of their use; Latin writers on uses of plants; when this knowledge reached the Romans; first Greek writers on the subject; herbal remedies, why comparatively little used; remarkable discoveries of plants. Dog-rose,

Cynorrodum, medicinae II, dracunculus caulis I, Britannica V. (vii–xix) De maximo dolore. nobilium herbarum inventores. moly III, dodecatheon I, paeonia sive pentorobos sive glycysides, I, panaces Asclepion II, panaces Heraclion III, panaces Chironion IV, panaces Centaurion sive Pharnacion III, Heraclion siderion IV, hyoscyamos, quae Apollinaris sive altercum, genera II, medicinae III, linozostis sive parthenion sive Hermupoa, quae Mercurialis, genera II, medicinae XXII, Achillea sideritis sive panaces Heraclium, quae millefolium sive scopa regia, gen. VI, med. III. (xx–xxix) Teucria sive hermione sive splenios II, Melampodium sive elleborum, quod veratrum, genera III; quomodo colligatur, quomodo probetur; medicinae ex nigro XXIV, quomodo sumendum; item in albo: medicinae ex eo XXIII; quibus non dandum; observationes circa utrumque genus LXXXVIII. Mithridatia II, scordotis sive scordion IV, Polemonia sive Philetaeria sive chiliodynamus VI, Eupatoria I, (xxx–xlii) Centaurion sive Chironion XX, Centaurion lepton sive libadion, quod fel terrae, XXII, Centauris triorchis II, Clymenos II, Gentiana XIII, Lysimachia VIII, Artemisia sive parthenis sive botrys sive ambrosia V, nymphaea sive Heraclion sive rhopalon sive mallos, genera II, medicinae XIV, Euphorbiae genera II, medicinae IV, plantaginis genera II, medicinae XLVI, buglossos III, cynoglossos III, buphthalmos sive cachla I. (xliii–ix) Herbae quas gentes invenerunt Scythice III, hippace III, ischaemon II, cestros sive psychotrophon, quae Vettonica sive serratula, XLVIII; Cantabrica II, consiligo I, Iberis VII. (l–liii) Herbae ab animalibus repertae chelidonia VI, canaria I, dictamnon VIII,

2 drugs, tarragon 1, water-clock 5. (vii–ix) The greatest pain. Discoverers of famous plants. Moly 3, shooting star 1, peony or pentorobus or glycysides 1, varieties of all-heal—Asclepion 2, Heraclion 3, Chironion 4, Centaurion or Pharnacion 3, iron-wort Heraclion 4, hyoscyamos or Apollo-plant or henbane, 2 kinds, 3 drugs; linozostis or maiden-hair or grass of Hermes or grass of Mercury, 2 kinds, 22 drugs; Achilles star-wort or all-heal of Heracles, our milfoil or king's-broom, 6 kinds, 3 drugs. (xx–xxix) Teucer's grass or hermione or spleenwort 2; Melampodium or hellebore, our veratrum 3 kinds, method of gathering, method of testing; drugs from black hellebore 24, how taken; *ditto* with white hellebore; drugs from the latter 23; to what patients not to be given: observations in regard to each kind 88. Grass of Mithridates 2, scordotis or water-germander 4, Polemonia or Philetaeria or thousand-virtues 6, Eupatoria 1. (xxx–xlii) Centaury or grass of Chiron 20, lesser centaury or libadion, our earth-gall (fumitory) 22, triorchis centaury 2, Clymenos 2, gentian 13, Lysimachia 8, Artemisia or maiden-herb or magwort or ambrosia 5, water-lily or rod of Heracles or rhopalon or mallos, 2 kinds, 14 drugs; Euphorbia 2 kinds, 4 drugs; plantain 2 kinds, 46 drugs; bugloss 3; hound's-tongue 3; ox-eye or cachla 1. (xliii–ix) Plants discovered by various races: Scythian grass 3, mare's-grass 3, styptic plant 2, cestros or psychotrophon, our Vettonica or betony, 48; Cantabrian bindweed 2, lung-wort 1, candy-tuft 7. (l–liii) Plants found from animals: swallow-wort 6, dog's-grass 1, dittany 8, sham-dittany or horehound.

pseudodictamnon sive chondris. quibus locis potentissimae herbae. propter herbas in Arcadia lac potari. (liv–lix) Aristolochia sive clematitis sive Cretica sive plistolochia sive lochia polyrrizos, quae malum terrae, XXII. argemonia IV, agaricum XXXIII, echios, genera III, medicinae II, hierabotane sive peristereon, quae verbenaca, genera II, medicinae X, blattaria I, molemonium I, pentapetes sive pentaphyllon sive chamaezelon, quae quinquefolium, medicinae XXXIII, sparganion I, dauci genera IV, medicinae XVIII, theronarca II, persolata sive arcion VIII, cyclaminos, quae tuber terrae, XII, cyclaminos cissanthemos IV, cyclaminos chamaecissos III. (lxx–xc) Peucedanum XXVIII, ebulum VI, phlomos quae verbascum XV, phlomides II, phlomis sive lychnitis sive thryallis, thelyphonon sive scorpio I, phrynion sive neuras sive poterion I, alisma sive damasonium sive lyron XVII, peristereos VI, antirrhinon sive anarrhinon sive lychnis agria III, euplia I, pericarpum, genera II, medicinae II, nymphaea Heraclia II, lingulaca I, cacalia sive leontice III, callithrix I, hyssopum X, lonchitis IV, xiphion sive phasganion IV, psyllion sive cynoides sive chrysallion sive Sicelicon sive cynomyia XVI, thryselinon I. (xci–cv) Remedia oculorum anagallis sive corchoron, quae felis oculus, genera II, medicinae III, aegilops II, mandragoras sive Circaeon sive morion sive hippophlomon, genera II, medicinae XXIV, cicuta XIII, crethmos agrios I, molybdaena I, capnos trunca, quae pedes gallinacei I, capnos fruticosa III, acoron sive acorion XIV, cotyledon, genera II, medicinae LXI, aizoum maius sive buphthalmon sive zoophthalmon sive stergethron sive hypogeson sive ambrosion sive

Localities where herbs most potent. Milk drunk for herbal contents in Arcady. (liv–lix) Aristolochia or clematis or Cretan plant or plistolochia or many-rooted lochia, our earth-bane, 22; agrimony 4, tinder-fungus 33; viper's-bugloss 3 kinds, 2 drugs; holy-wort or dove-wort, our vervain, 2 kinds 10 drugs; moth-mullein 1, molemony 1; pentapetes or pentaphyllon or chamaezelon, our cinquefoil, 33 drugs; bur-weed 1; wild carrot, 4 kinds, 18 drugs; theronarca 2; brown mullein or arcion 8; cyclamen, our mole-hill plant, 12; ivy-flower cyclamen 4; ground-ivy cyclamen 3. (lxx–xc) Sulphurwort 28, dwarf elder 6; phlomos, our mullein 15; phlomides 2, phlomis or wild lychnis or thryallis; thelyphonon or scorpion-grass (aconite) 1; phrynion or neuras or poterion 1; water-plantain or damasonium or lyron 17; vervain 6; antirrhinum or anarrhinum or wild lychnis 3; euplia 1; pericarpum, 2 kinds, 2 drugs; Hercules water-lily 2; marsh crowfoot 1; colt's-foot or lion-wort 3; hair-dye plant 1; hyssop 10; satyrion 4; gladiolus or sword-lily 4; flea-bane or dog-wort or gold garlic or Sicilian grass or dog-fly 16; thryselinon 1. (xci–cv) Eyesalves: pimpernel or chickweed, our cat's-eye, 2 kinds, 3 drugs; aegilops 2, mandragora or Circe's herb or nightshade or white mandrake, 2 kinds, 24 drugs; hemlock 13; wild sea-fennel 1, leadwort 1; 'dwarfed smoke,' our chicken-feet (fumitory) 1; bush-smoke 3; acoron or sweet-flag 14; navelwort, 2 kinds 61 drugs; greater live-for-ever or ox-eye or zoophthalmon or love-charm or gutter-leek or immortal or care-free, our great

amerimnon, quae sedum magnum aut oculus aut digitellus, medicinae XXXI; aizoum minus sive erithales sive trithales sive erysithales, quae isoetes aut sedum, medicinae XXXII; andrachle agria, quae inlecebra, XXXII. (cvi–x) Erigeron sive pappos sive acanthis, quae senecio, VIII; ephemeron II, labrum Venereum I, batrachion, quae ranunculus sive strumos, genera IV, medicinae XIV stomatice, genera II. Summa: medicinae et historiae et observationes MCCXCII.

Ex auctoribus: C. Valgio, Pompeio Lenaeo, Sextio Nigro qui Graece scripsit, Iulio Basso qui item, Antonio Castore, Cornelio Celso, Fabiano. Externis: Theophrasto, Apollodoro, Democrito, Iuba, Orpheo, Pythagora, Magone, Menandro qui βιόχρηστα, Nicandro, Homero, Hesiodo, Musaeo, Sophocle, Xantho, Anaxilao. Medicis: Mnesitheo, Callimacho, Phania physico, Timaristo, Simo, Hippocrate, Chrysippo, Diocle, Ophione, Heraclide, Hicesio, Dionysio, Apollodoro Citiense, Apollodoro Tarentino, Praxagora, Plistonico, Medio, Dieuche, Cleophanto, Philistione, Asclepiade, Crateua, Petronio Diodoto, Iolla, Erasistrato, Diagora, Andrea, Mneside, Epicharmo, Damione, Sosimene, Tlepolemo, Metrodoro, Solone, Lyco, Olympiade Thebana, Philino, Petricho, Miccione, Glaucia, Xenocrate.

Libro XXVI. continentur reliquae per genera medicinae. (i) De novis morbis. (ii–vi) Quid sint lichenes; quando primum in Italia coeperint; item carbunculus; item elephantiasis; item colum. (vii–ix) De nova medicina; de Asclepiade medico. qua ratione medicinam veterem mutaverint; contra Magos. (x–xix) Lichen, genera II, medicinae V; Proserpinaca I, bellis II, condurdum I, bechion sive

houseleek or eye or little finger, 31 drugs; lesser live-for-ever or erithales or trithales or erysithales, our aye-green or stonecrop, 32 drugs; wild purslane, our decoy-bird 32. (cvi–x) Erigeron or pappos or groundsel, our old-man, 8; ephemeron 2; Venus's-lip 1, frog-weed, our ranunculus or buttercup, 4 kinds, 14 drugs; mouth-heal, 2 kinds. Total 1292 drugs, investigations and observations.

Authorities: Gaius Valgius, Pompeius Lenaeus, Sextius Niger's Greek writings, Julius Bassus's *ditto*, Antonius Castor, Cornelius Celsus, Fabianus. Foreign authorities: Theophrastus, Apollodorus, Democritus, Juba, Orpheus, Pythagoras, Mago, Menander's *Things serviceable for life*, Nicander, Homer, Hesiod, Musaeus, Sophocles, Xanthus, Anaxilaus. Medical writers: Mnesitheus, Callimachus, Phanias the natural scientist, Timaristus, Simus, Hippocrates, Chrysippus, Diocles, Ophion, Heraclides, Hicesius, Dionysius, Apollodorus of Citium, Apollodorus of Tarentum, Praxagoras, Plistonicus, Medius, Dieuches, Cleophantus, Philistion, Asclepias, Crateuas, Petronius Diodotus, Iollas, Erasistratus, Diagoras, Andreas, Mnesides, Epicharmus, Damion, Sosimenes, Tlepolemus, Metrodorus, Solon, Lycus, Olympias of Thebes, Philinus, Petrichus, Miccio, Glaucias, Xenocrates.

Book XXVI. Contents: the remaining drugs by classes. (i) New diseases. (ii–vi) Ringworm—when first occurring in Italy; carbuncle *ditto*; elephantiasis *ditto*; colic *ditto*. (vii–ix) The new medicine; the physician Asclepias; reason for alteration of the old medicine; refutation of Magi. (x–xix) Lichen, 2 kinds, 5 drugs, Proserpinaca 1, ox-eye daisy 2, condurdum

arcion sive chamaeleuce, quae tussilago, III, bechion, salvia, IV, molon sive syron, amomon III, (xx–xxix) ephedra sive anabasis III, geum III, tripolion III, gromphaena, malundrum II, chalcetum II, molemonium I, halus sive cotonea V, chamaerops I, stoechas I, astragalus VI. (xxx–xxxix) Ladanum VIII, chondris sive pseudodictamnum I, hypocisthis sive orobethron, genera II, medicinae VIII, laver sive sion II, potamogiton VIII, statice III, ceratia II, leontopodion sive leuceoron sive doribethron sive thorybethron; lagopus III; epithymon sive hippopheos VIII; pycnocomon IV; polypodion III; scammonia VIII; tithymalos characias. (xl–xlvi) Tithymalos myrtites sive caryites XXI; tithymalos paralius sive tithymalis IV, tithymalos helioscopios XVIII; tithymalos cyparissias XVIII; tithymalos platyphyllos sive corymbites sive amygdalites III; tithymalos dendroides sive cobios sive leptophyllos XVIII; apios ischias sive raphanos agria II: (l–lix) Crethmon XI, cachry; anthyllion II, anthyllis II; cepaea I; hypericon sive chamaepitys sive corisson IX; caros sive hypericon X; callithrix I, perpressa I, chrysanthemum I, anthemis I; silaus I; herba Fulviana; inguinalis sive argemo. (lx–lxix) Chrysippeos I; orchis sive Serapia V; Satyrion III, satyrion Erythraicon IV; lappago sive mollugo I, asperugo I; phycos, quod fucus marinus, genera III, medicinae V; lappa boaria; geranion sive myrris sive myrtis, genera III, medicinae VI; onothera sive onear III. (lxxiii) Acte sive ebulum, chamaeacte. (lxxxiii–xciii) Hippuris sive ephedron sive anabasis, quae equisaetum, genera III, medicinae XVIII; stephanomelis; erysithales I; polycnemon I; arsenogonon I, thelygonon I; mastos I,

1, bechion or arcion or chamaeleuce, our white colt's-foot, 3; bechion, our sage, 4; molon or syron, balsam-shrub 3. (xx–xxix) Horse-tail or anabasis 3, geum 3, tripolion 3, amaranth, malundrum 2, chalcetum 2, molemonium 1; comfrey or black bryony 5, wall germander 1, French lavender 1, Spanish tragacanth 6. (xxx–xxxix) Ladanum 8; horehound or bastard dittany 1, cisthus-parasite or orobethron, 2 kinds, 8 drugs; laver or sion 2; pond-weed 8, statice 3; horn-weed 2, lentopodion or leuceoron or doribethron or thorybethron; hare's foot 3; thyme-flower or hippopheos 8; devil's-bit 4; polypody 3; scammony 8; stake-spurge. (xl–xlvi) Myrtle-spurge or nut-spurge 21, sea-spurge or thymalis 4, heliotrope spurge 18, cyparissias-spurge 18, broadleaved spurge or corymbites or almond-spurge 3; tree-spurge or cobius or small-leaved spurge 18; sciatica-spurge or wild radish 2. (l–lix) Sea-fennel 11, sea-fennel kernel, pitch-plant 2, musk-ivy 2, portulaca 1, hypericon or ground-pine or corisson 9, ground-pine seed or hypericon 10, hair-dye plant 1, perpressa 1, marigold 1, chamomile 1, smallage 1, Fulvius-grass, groin-grass or argemo. (lx–lxix) Chrysippus-grass 1, orchis or Serapia 5, ragwort 3, red ragwort 4, lappago-bur or mollugo 1, prickly bur 1, phycos, our sea-weed, 3 kinds, 5 drugs; cattle-bur; crane's bill or geranium or myrtis, 3 kinds, 6 drugs; donkey-hunt or refreshment-plant 3, (lxxiii) Danewort or dwarf-elder, ground Dane-wort. (lxxxiii–xciii) Horse-tail or ephedron or anabasis, our horse-hair, 3 kinds, 18 drugs; stephanomelis; erysithales 1, polycnemon 1, arsenogonon 1, thelygonon 1, mastos 1,

ophrys. Summa: medicinae et historiae et observationes MXIX.

Ex auctoribus: M. Varrone, C. Valgio, Pompeio Lenaeo, Sextio Nigro qui Graece scripsit, Iulio Basso qui item, Antonio Castore, Cornelio Celso. Externis: Theophrasto, Apollodoro, Democrito, Iuba, Orpheo, Pythagora, Magone, Menandro qui *βιόχρηστα* scripsit, Nicandro, Homero, Hesiodo, Musaeo, Sophocle, Xantho, Anaxilao. Medicis: Mnesitheo, Callimacho, Phania physico, Timaristo, Simo, Hippocrate, Chrysippo, Diocle, Ophione, Heraclide, Hicesio, Dionysio, Apollodoro Citiense, Apollodoro Tarentino, Praxagora, Plistonico, Medio, Dieuche, Cleophanto, Philistione, Asclepiade, Crateua, Petronio Diodoto, Iolla, Erasistrato, Diagora, Andrea, Mneside, Epicharmo, Damione, Sosimene, Tlepolemo, Metrodoro, Solone, Lyco, Olympiade Thebana, Philino, Petricho, Miccione, Glaucia, Xenocrate.

Libro XXVII. continentur reliqua genera herbarum, medicinae ex his. (ii–x) Aconitum sive thelyphonon sive cammoron sive pardalianches sive scorpion, medicinae IV; Aethiopis IV; ageraton IV; aloe XXIX; alcea I; alypon I, alsine ad eadem quae helxine V; androsaces VI; androsaemon sive ascyron VI. (xi–xx) Ambrosia sive botrys sive Artemisia III; anonis sive ononis V; anagyros sive acopon III; anonymos II, aparine sive omphacocarpos sive philanthropos IV; arction sive arcturon V; asplenon sive hemionios II; Asclepias II: aster sive bubonion III; ascyron et ascyroides III. (xxi–xxx) Aphaca III, alcibium I; alectoros lophos, quae crista, II; alum, quod symphyton pe-

ophrys. Total, 1019 drugs, investigations and observations.

Authorities: Marcus Varro, Gaius Valgius, Pompeius Lenaeus, Sextius Niger's Greek writings, Julius Bassus's *ditto*, Antonius Castor, Cornelius Celsus. Foreign Authorities: Theophrastus, Apollodorus, Democritus, Juba, Orpheus, Pythagoras, Mago, Menander's *Things serviceable for life*, Nicander, Homer, Hesiod, Musaeus, Sophocles, Xanthus, Anaxilaus. Medical writers: Mnesitheus, Callimachus, Phanias the natural philosopher, Timaristus, Simus, Hippocrates, Chrysippus, Diocles, Ophion, Heraclides, Hicesius, Dionysius, Apollodorus of Citium, Apollodorus of Tarentum, Praxagoras, Plistonicus, Medius, Dieuches, Cleophantus, Philistion, Asclepiades, Crateuas, Petronius Diodotus, Iollas, Erasistratus, Diagoras, Andreas, Mnesides, Epicharmus, Damion, Sosimenes, Tlepolemus, Metrodorus, Solon, Lycus, Olympias of Thebes, Philinus, Petrichus, Miccio, Glaucias, Xenocrates.

Book XXVII. Contents: the remaining kinds of plants, drugs derived from them. (ii–x) Monk's-hood or lady-killer or cammoron or choke-leopard or scorpion, 4 drugs; Aethiopic sage 4; never-grow-old 4; aloe 29; alcea-mallow 1; herb terrible 1; chickweed for the same uses as helxine 5; androsaces 6; man's-blood or St. John's-wort 6. (xi–xx) Ambrosia or mug-wort or Artemisia 3, rest-harrow or ononis 5, bean-trefoil or pain-killer 3, no-name 2, cleavers or grape-fruit or goose-grass 4, bear-weed or bear-ward 5, miltwort or spleenwort 2, swallowwort 2, aster or star-wort 3, St. John's wort and ascyroides 3. (xxi–xxx) Chick-pea 3, alcibium 1, alectoros lophos, our cock's-comb 2, comfrey, our rock wallwort 14,

traeum, XIV, alga rufa I; actaea I; ampelos agria IV; absinthium, genera IV, medicinae XLVIII; absinthium marinum sive seriphum; ballotes sive porrum nigrum III; (xxxi–xl) botrys sive ambrosia sive Artemisia I; brabyla I; bryon marinum V; bupleuron I; catanance I, cemos I; calyx III; calyx sive anchusa sive rhinoclia II; Circaea III; cirsion I; crataegonon, genera III, medicinae VIII; (xli–l) crocodileon II; cynosorchis sive orchis IV; chrysolachanum, genera II, medicinae III, coagulum terrae II; cucullus sive strumus sive strychnos VI; conferva II; coccum Cnidium II; dipsacos III; dryopteris II; (xlix) drabe I; elatine II; (li–lx) empetros, quam nostri calcifragam, IV; epicactis sive elleborine II; epimedion III; enneaphyllon III; filicis genera II, quam Graeci pterim, alii blachnon, item thelypterim, nymphaeam pterim vocant, XI; femur bubulum; galeopsis sive galeobdolon sive galion VI; glaux I; glaucion III (collyrium, medicinae II); glycyside sive Paeonia sive pentorobon XX; (lxi–lxx) gnaphalion sive chamaezelon VI; gallidraga I; holcus sive aristis; hyoseris I; holosteon III; hippophaeston VIII; hypoglossa I; hypecoon; Idaea IV; isopyron sive phasiolon II; (lxxi–lxxx) lathyris II; leontopetalon, alii rhapeion, II; lycapsos II; lithospermon sive exonychon sive diospyron; sive Heracleos II; lapidis muscus I; limeum I, leuce sive mesoleucium sive leucas III; leucographis V; medion III; myosota sive myosotis III; (lxxxi, xc) myagros I; nyma I; natrix I; odontitis I; othonna I; onosma I; onopradon V; osyris IV; oxys II; polyanthemum sive batrachion III; (xci–c) polygonos sive polygonatos sive thalattias sive carcinothron sive clema sive myrtopetalos, quae

red seaweed 1, herb Christopher 1, wild vine 4; wormwood, 4 kinds, 48 drugs; sea-wormwood or seriphum; horehound or black chives 3. (xxxi–xl) Mugwort or ambrosia or Artemisia 1, brabyla 1; sea bryon 5, hare's-ear 1, catanance 1, cemos 1, calyx 3, calyx or strangle-plant or rhinoclia 2, herb of Circe 3, cirsion thistle 1; crataegonon, 3 kinds, 8 drugs; (xli–l) crocodile plant 2, hound's-cod or orchis 4, garden orach, 2 kinds, 3 drugs, earth-bond 2, nightshade or strumus or strychnos 6, salve-herb 2, Cnidus berry 2, teasel 3, oak-wing 2, drabe 1, elatine 2. (li–lx) Harts-tongue, called in Latin break-stone, 4; epicactis or helleborine 2, epimedion 3, nine-leaf 3, fern, 2 kinds called by the Greeks 'feather-fern' or blachnon, also female feather or bride's-feather, 11; ox-thigh; dead-nettle or galeobdolon or galion 6; owl-plant 1; celandine 3 (pillar-plant, 2 drugs) glycysis or peony or pentorobon 20. (lxi–lxx) Cotton-grass or cudweed 6, hairy teasel 1, mouse-barley or aristis, black centaury, white plantain 3, hippophaeston 8, butcher's broom 1, humble-plant, grass of Ida 4, isopyron or phasiolon 2. (lxxi–lxxx) Wolf's-milk 2, lion's-leaf (others call it 'rhapeion') 2, alkanet 2, lithospermon or exonychon or diospyron or grass of Hercules 2, stone-crop 1, arrow-poison 1, spotted dead-nettle or mesoleucium or leucas 3, St. Mary's thistle 5; medion 3, mouse-ear or forget-me-not 3. (lxxxi–xc) Mouse-hunter 1, nyma 1, water-snake 1, toothwort 1, othonna 1, onosma 1, St. Mary's thistle 5, goose-foot 4, wood sorrel 2, many-flowered crowfoot or frogwort 3. (xci–c) Knot-grass or polygonatum or sea-grass or carcinothron or clema or bayleaf (the same as blood-

sanguinaria sive orios, genera IV, medicinae XL; pancration XII; peplis sive syce sive meconion sive mecon aphrodes III; periclymenon V; pelecinos I; polygala I; poterion sive phrynion sive neuras IV; phalangites sive phalangion sive leucacanthon IV, phyteuma I; phyllon I; (ci–cx) phellandrion II, phaleris II; polyrrizon V; Proserpinaca V; rhecoma XXXVI; reseda II; stoechas III; solanum, quam Graeci strychnon, II; Smyrnion XXXII, sinon II; Telephion IV; (cxi–cxvii) trichomanes V, thalictrum I, thlaspi sive Persicon napy IV; Trachinia I; tragonis sive tragion I; tragos sive scorpio IV; tragopogon sive come I. (cxviii–cxx) De aetatibus herbarum; quomodo cuiusque vires efficaciores. Gentium vitia diversa. Summa: medicinae et historiae et observationes DCII.

Ex auctoribus: C. Valgio, Pompeio Lenaeo, Sextio Nigro qui Graece scripsit, Iulio Basso qui item, Antonio Castore, Cornelio Celso. Externis: Theophrasto, Apollodoro, Democrito, Aristogitone, Orpheo Pythagora, Magone, Menandro qui βιόχρηστα scripsit, Nicandro. Medicis: Mnesitheo, Callimacho, Timaristo, Simo, Hippocrate, Chrysippo, Diocle, Ophione, Heraclide, Hicesio, Dionysio, Apollodoro Citiense, Apollodoro Tarentino, Praxagora, Plistonico, Medio, Dieuche, Cleophanto, Philistione, Asclepiade, Crateua, Petronio Diodoto, Iolla, Erasistrato, Diagora, Andrea, Mneside, Epicharmo, Damione, Sosimene, Tlepolemo, Metrodoro, Solone, Lyco, Olympiade Thebana, Philino. Petricho, Miccione, Glaucia, Xenocrate.

Libro XXVIII. continentur medicinae ex animalibus. (iii) An sit in medendo verborum aliqua vis.

weed or orios) 4 kinds, 40 drugs; succory 12, peplis or syce or meconion or foam-poppy 3, honeysuckle 5, hatchet-vetch 1, milkwort 1, tragacanth or frog-cup or tendon-plant 4; anthericum or spider-root or whitethorn 4; groundsel 1; phyllon 1. (ci–cx) Phellandrion 2, canary-grass 2, many-root 5, Proserpinaca 5, rhecoma 36, reseda 2, French lavender 3, nightshade, Greek strychnon, 2; common alexanders 32, sinon 2, purslane 4. (cxi–cxvii) Madlocks 5, meadow-rue 1, thlaspi or Persian mustard 4, herb of Trachis 1, tragonis or goatwort 1, goat-grass or scorpion-grass 4, goat's-beard or come 1. (cxviii–cxx) Length of life of herbs; means of increasing the potency of each kind. Different national maladies. Total, 602 drugs, investigations and observations.

Authorities: Gaius Valgius, Pompeius Lenaeus, Greek works of Sextius Niger, *ditto* of Julius Bassus, Antonius Castor, Cornelius Celsus. Foreign authorities: Theophrastus, Apollodorus, Democritus, Aristogiton, Orpheus, Pythagoras, Mago, Menander's *Things serviceable for life*, Nicander. Medical writers: Mnesitheus, Callimachus, Timaristus, Simus, Hippocrates, Chrysippus, Diocles, Ophion, Heraclides, Hicesius, Dionysius, Apollodorus of Citium, Apollodorus of Tarentum, Praxagoras, Plistonicus, Medius, Dieuches, Cleophantus, Philistion, Asclepiades, Crateuas, Petronius Diodotus, Iollas, Erasistratus, Diagoras, Andreas, Mnesides, Epicharmus, Damion, Sosimenes, Tlepolemus, Metrodorus, Solon, Lycus, Olympias of Thebes, Philinus, Petrichus, Miccio, Glaucia, Xenocrates.

Book XXVIII. Contents: drugs obtained from animals. (iii) Whether there is any healing power

(iv–v) Ostenta et sanciri et depelli. (vi–xix) Ex homine remedia; contra magos; ex viro medicinae et observationes CCXXVI, puero VIII; (xx–xxiii) muliere LXI, (xxiv–xxxii) ex peregrinis animalibus elephanto VIII, leone X, camelo X, hyaena LXXIX, crocodilo XIX, crocodilea XI, chamaeleone XV, scinco IV, hippopotamio VII, lynce V. (xxxiii–xli) Medicinae communes ex animalibus feris aut eiusdem generis placidis; lactis usus et observationes LIV, de caseis XII; butyro XXV; oxygala I; adipis usus et observationes LII; de sebo; de medulla; de felle; de sanguine. (xlii–lxxx) Privatae ex animalibus medicinae digestae in morbos, ex apro XII, sue LX, cervo III, lupo XXVII, urso XXIV, onagro XII, asino LXXVI, polea III, equifero XI, eculei coagulo I, equo XLII, hippace I, bubus feris II, bove LXXXI, tauro LIII, vitulo LIX, lepore LXIV, volpe XX, mele II, fele V, capra CXVI, hirco XXXI, haedo XXI. (lxxi) De glutino taurino probando, et medicinae ex eo VII. Summa: medicinae et historiae et observationes MDCLXXXII.

Ex auctoribus: M. Varrone, L. Pisone, Antiate, Verrio, Fabiano, Catone censorio, Servio Sulpicio, Licinio Macro, Celso, Masurio, Sextio Nigro qui Graece scripsit, Bytho Durracheno, Rabirio medico, Ofilio medico, Granio medico. Externis: Democrito, Apollonio qui et Mys, Meleto, Artemone, Sextilio Antaeo, Homero, Theophrasto, Lysimacho, Attalo, Xenocrate, Orpheo qui ἰδιοφυῆ scripsit, Archelao qui item, Demetrio, Sotira, Laide, Elephantide, Salpe, Olympiade Thebana, Diotimo Thebano, Iolla, Andrea, Marcione Zmyrnaeo,

in spoken charms. (iv–v) Portents ratified and rejected. (vi–xix) Remedies obtained from the human body; against magicians; 226 drugs and observations derived from an adult male, 8 from a boy; (xx–xxiii) 61 from a woman; (xxiv–xxxii) from foreign animals —elephant 8, lion 10, camel 10, hyena 79, crocodile 19, crocodile's excrement 11, chameleon 15, lizard 4, hippopotamus 7, lynx 5. (xxxiii–xli) Drugs obtained equally from wild animals and tame animals of the same kind; milk, modes of using and remarks as to, 54; cheeses 12; butter 25; sour milk 1; fat, modes of using and observations as to, 52; suet; marrow; gall; blood. (xlii–lxxx) Special drugs derived from particular animals arranged according to diseases; from the boar 12, pig 60, stag 3, wolf 27, bear 24, wild ass 12, ass 76, ass's foal 3, wild horse 11, foal's rennet 1, horse 42, mare's milk cheese 1, wild oxen 2, ox 81, bull 53, calf 59, hare 64, fox 20, badger 2, cat 5, she-goat 116, he-goat 31, kid 21. (lxxi) On testing bull-glue, and 7 drugs from it. Total 1682 drugs, investigations and observations.

Authorities: Marcus Varro, Lucius Piso, Antias, Verrius, Fabianus, Cato the ex-Censor, Servius Sulpicius, Licinius, Macer, Celsus, Masurius, Greek works of Sextius Niger, Bythus of Durazzo, medical works of Rabirius, Ofilius and Granius. Foreign authorities: Democritus, Apollonius alias the Mouse, Meletus, Artemon, Sextilius Antaeus, Homer, Theophrastus, Lysimachus, Attalus, Xenocrates, Orpheus writer of *Idiophye*, Archelaus *ditto*, Demetrius, Sotira, Lais, Elephantis, Salpe, Olympias of Thebes, Diotimus of Thebes, Iollas, Andreas, Marcio of Smyrna, medical works of Aeschines, Hippocrates,

Aeschine medico, Hippocrate, Aristotele, Metrodoro Scepsio, Hicetida medico, Apelle medico, Hesiodo, Bialcone, Caecilio, Bione qui περὶ δυνάμεων scripsit, Anaxilao, Iuba rege.

Libro XXIX. continentur medicinae ex animalibus. (i–viii) de origine medicinae; de Hippocrate; quando primum clinice, quando primum iatraliptice; de Chrysippo medico, de Erasistrato; de empirice; de Herophilo; de reliquis inlustribus medicis; quotiens ratio medicinae mutata sit; quis primus Romae medicus et quando; quid de medicis antiquis Romani iudicaverint; vitia medicinae. (ix–xiii) remedia ex lanis XXXV et sequenti libro XXV = LX; oesypo XXXII, sequenti libro XX = LII; ovis XXII, sequenti libro XLIII = LXV; quae sitista ova; quomodo fiant tota lutea; de serpentium ovis; de Commageno conficiendo; medicinae ex eo IV et sequenti libro V = IX. (xiv–xl) remedia ex animalibus quae placida non sint aut fera (ariete V et sequenti libro VII = XII, pecude II et sequenti libro XV = XVII, mulis I et sequenti libro V = VI, caballis I et sequenti libro III = IV, cane XVI et sequenti libro XLI = LVII, cane rabioso III et sequenti libro II = V, ichneumone I, mure XIV et sequenti libro XXVIII = XLII, mure araneo IV et sequenti libro I = V, glire II et sequenti libro VI= VIII, sorice I et sequenti libro II = III, mustela XIX et sequenti libro XXV = XLIV, stellione IV et sequenti libro XII = XVI, erinaceo V et sequenti libro XIII = XVIII, hystrice I et sequenti libro II = III, lacerta XIII et sequenti libro XXX = XLIII, salamandra I et sequenti libro III = IV, coclea XXVII et sequenti libro * XIX [1] = * XLVI, aspide I et sequenti libro III =

Aristotle, Metrodorus of Scepsis, medical works of Hicetidas and Apelles, Hesiod, Bialcon, Caecilius, Bion's *On Potencies*, Anaxilaus, King Juba.

Book XXIX. Contents: drugs obtained from animals. (i–viii) Origin of medicine; Hippocrates; first employment of clinic medicine, first employment of embrocations; Chrysippus the physician, Erasistratus; experimental medicine; Hierophilus; remaining famous physicians; how often the system of medicine has altered; the first physician at Rome, name and date; judgement of Romans as to ancient physicians; defects of medicine. (ix–xiii) Cures from wools 35 and in the next book 25, making 60; from wool-washings 32, next book 20, making 52; from eggs 22, next book 43, making 65; meaning of 'fattened' eggs; how to make eggs all yoke; snakes' eggs; how to make Commagene-cure; drugs from it 4, and in next book 5, making 9. (xiv–xl) Remedies from roaming or wild animals (ram 5 and next book 7 = 12, sheep 2 and next book 15 = 17, mules 1 and next book 5 = 6, horses 1 and next book 3 = 4, dog 16 and next book 41 = 57, mad dog 3 and next book 5 = 7, ichneumon 1, mouse 14 and next book 28 = 42, pygmymouse 4 and next book 1 = 5, dormouse 2 and next book 6 = 8, shrew-mouse 1 and next book 2 = 3, weasel 19 and next book 25 = 44, gecko 4 and next book 12 = 16, hedgehog 5 and next book 13 = 18, porcupine 1 and next book 2 = 3, lizard 13 and next book 30 = 43, salamander 1 and next book 3 = 4, snail 27 and next book 19 = 46, asp 1 and next book 3 = 4,

[1] Asterisks mark numbers corrected by editors to conform with text of Book XXIX.

IV, basilisco IV, dracone * IV et sequenti libro * VI = * X, vipera XIV et sequenti libro XXI = XXXV, (xxi de viperino sale theriace; xxxviii echeon), angue VIII et sequenti libro XXVII = XXXV, hydro I, bova IV et sequenti libro III = VII, enhydride I et sequenti libro II = III, serpentibus ceteris VIII et sequenti libro VII = XV, scorpione IV et sequenti libro II = VI, araneorum et phalangiorum genera XII, medicinae ex his IX et sequentilibro XXVII = XXXVI, gryllo sive tauro I et sequenti libro VII = VIII, scolopendra sive multipeda sive millepeda sive centipeda sive onisco sive iulo I et sequenti libro XX = XXI, (xvii admiratio naturae nihil sine usu gignentis), limace I et sequenti libro III = IV, uruca I et sequenti libro II = III, verme terreno II et sequenti libro * XX = * XXII, verme ex arboribus I et sequenti libro IV = V, ex volucribus aquila IV et sequenti libro III = VII, volture * IX et sequenti libro * VII = * XVI, gallinaceo XXI et sequenti libro XXXV = LVI, gallina X et sequenti libro XXII = XXXII, ansere VII et sequenti libro XV = XXII, cygno I et sequenti libro V = VI, (xiii de adipe avium conficiendo), corvo II et sequenti libro IV = VI, cornice I et sequenti libro II = III, accipitre II et sequenti libro II = * IV, milvo II et sequenti libro VI = VIII, cenchride II, ciconia II et sequenti libro I = III, anate II et sequenti libro IV = VI, perdice VI et sequenti libro XI = XVII, columba VII et sequenti libro XXV = XXXII, palumbe II et sequenti libro XIV = XVI, pico Martio I, turture IV et sequenti libro V = IX, hirundine IX et sequenti libro * XXIV = * XXXIII, noctua IV et sequenti libro V = IX, ulula I et sequenti libro I = * II,

basilisk 4, serpent 4 and next book 6 = 10, viper 14 and next book 21 = 35 (xxi, salt antidote for viper-bite; xxxviii, adder-ash drug) snake 8 and next book 27 = 35, water-serpent 1, ox-snake 4 and next book 3 = 7, water-snake 1 and next book 2 = 3, the other serpents 8 and next book 7 = 15, scorpion 4 and next book 2 = 6, spiders and poison-spiders, 12 kinds, drugs from these 9 and next book 27 = 36, cricket or bull-beetle 1 and next book 7 = 8, scolopendra or multipede or millepede or centipede or wood-louse or catkin 1 and next book 20 = 21 (xvii, admiration of nature who produces nothing useless), slug 1 and next book 3 = 4, caterpillar 1 and next book 2 = 3, earth-worm 2 and next book 20 = 22, tree-worm 1 and next book 4 = 5; from birds—eagle 4 and next book 3 = 7, vulture 9 and next book 7 = 16, cock 21 and next book 35 = 56, hen 10 and next book 22 = 32, goose 7 and next book 15 = 22, swan 1 and next book 5 = 6 (xiii manufacture of bird's lard); raven 2 and next book 4 = 6, crow 1 and next book 2 = 3, hawk 2 and next book 2 = 4, kite 2 and next book 6 = 8, goshawk 2, stork 2 and next book 1 = 3, duck 2 and next book 4 = 6, partridge 6 and next book 11 = 17, dove 7 and next book 25 = 32, pigeon 2 and next book 14 = 16, Mars's woodpecker 1, turtle-dove 4 and next book 5 = 9, swallow 9 and next book 24 = 33, night-owl 4 and next book 5 = 9, screech-owl 1 and next book

bubone II et sequenti libro V = VII, vespertilione IV et sequenti libro * IX = XIII, apibus V et sequenti libro VII = XII, bupresti III et sequenti libro III = VI, pityocampe II et sequenti libro IV = VI, (xvii naturae benignitatem etiam foedis animalibus inseruisse magna remedia), scarabaeo I et sequenti libro VII = VIII, blatta IV et sequenti libro XIII = XVII. (xxx) de genere cantharidum. medicinae ex his V et sequenti libro XI = XVI, cimice * IX et sequenti libro V = XIV, musca VII et sequenti libro V = XII, locustis IV et sequenti libro III = VII, attelebis I, formicis III et sequenti libro V = * VIII. Summa: medicinae et historiae et observationes DCXXI.

Ex auctoribus: M. Varrone, L. Pisone, Flacco Verrio, Antiate, Nigidio, Cassio Hemina, Cicerone, Plauto, Celso, Sextio Nigro qui Graece scripsit, Caecilio medico, Metello Scipione, Ovidio poeta, Licinio Macro. Externis: Palaephato, Homero, Aristotele, Orpheo, Democrito, Anaxilao. Medicis: Botrye, Apollodoro, Archedemo, Aristogene, Xenocrate, Democrate, Diodoro, Chrysippo, Philippo, Oro, Nicandro, Apollonio Pitanaeo.

Libro XXX. continentur medicinae ex animalibus reliquae prioribus libris. (i–vii) de origine magices; quando et a quo coeperit, a quibus celebrata sit; an exercuerit eam Italia. quando primum senatus vetuerit hominem immolari; de Galliarum Druidis; de generibus magices; opinio magorum de talpis; medicinae V. (viii–liii) reliquae medicinae per morbos digestae in animalibus quorum genera non sunt placida aut fera: pecude * II [1] et priore libro * XV = * XVII, ariete VII et priore libro V = XII,

[1] See note on p. 131.

1 = 2, horned owl 2 and next book 5 = 7, bat 4 and next book 9 = 13, bees 5 and next book 7 = 12, cow-fly 3 and next book 3 = 6, pine-grub 2 and next book 4 = 6, (xvii that the beneficence of nature has placed powerful remedies even in disgusting animals), beetle 1 and next book 7 = 8, cockroach 4 and next book 13 = 17. (xxx) The genus Spanish fly—drugs from these 5 and next book 11 = 16, bug 9 and next book 5 = 14, house-fly 7 and next book 5 = 12, locusts 4 and next book 3 = 7, wingless locust 1, ants 3 and next book 5 = 8.—Total 621 drugs, investigations and observations.

Authorities: Marcus Varro, Lucius Piso, Verrius Flaccus, Antias, Nigidius, Cassius Hemina, Cicero, Plautus, Celsus, Sextius Niger (Greek works of), Caecilius the medical writer, Metellus Scipio, the poet Ovid, Licinius Macer. Foreign authorities: Palaephatus, Homer, Aristotle, Orpheus, Democritus, Anaxilaus. Medical writers: Botrys, Apollodorus, Archedemus, Aristogenes, Xenocrates, Democrates, Diodorus, Chrysippus, Philip, Orus, Nicander, Apollonius of Pitane.

Book XXX. Contents: drugs obtained from animals (concluded). (i–vii) Origin of magic—date and place of its commencement, by whom practised; whether carried on in Italy. Human sacrifice, when first prohibited by the senate; the Druids of the Gauls; kinds of magic; magicians' view as to moles; 5 drugs. (viii–liii) Remaining drugs, arranged according to diseases, found in animals not classed as tame or wild: cattle 2 and in last book 15 = 17, ram 7 and in last book 5 = 12, wool 25 and in last

lana XXV et priore libro XXXV = LX. oesypo XX et priore libro XXXII = LII, mulis V et priore libro I = VI, caballis III et priore libro I = * IV, cane XLI et priore libro XVI = * LVII, cane rabioso II et priore III = V, viverra I, mure XXVIII et priore libro XIV = LXII, mure araneo I et priore libro IV = V, glire VI et priore libro II = VIII, sorice II et priore libro I = III, mustela XXV et priore libro XIX = XLIV, stellione XII et priore libro IV = XVI, erinaceo XIII et priore libro V = XVIII, hystrice II et priore libro I = III, lacerta XXX et priore libro XIII = XLIII, salamandra III et priore libro I = IV, coclea XIX et priore libro XXVII = XLVI (xliii ageraton [1] medicamentum), aspide III et priore libro I = IV, dracone VI et priore libro IV = X, vipera XXI et priore libro XIV = XXXV, angue XXVII et priore libro VIII = XXXV, bova III et priore libro IV = VII, enhydride II et priore libro I = III, amphisbaena III, serpentibus ceteris VII et priore libro VIII = XV scorpione II et priore libro IV = VI, araneorum et phalangiorum genera * XII, medicinae XXVII et priore libro IX = XXXVI, troxalide III, phryganione I, scolopendra sive multipeda sive millepeda sive centipeda sive onisco sive iulo XX et priore libro I = XXI, (admiratio naturae nihil sine usu gignentis), limace III et priore libro I = IV, uruca II et priore libro I = III, verme terreno XX et priore libro II = XXII, verme ex arboribus IV et priore libro I = V, verme ex herba VIII, herpete I, ricino III, ex volucribus aquila III et priore libro IV = VII, volture VII et priore libro IX = XVI, ossifrago VI, gallinaceo XXXV et priore libro XXI = LVI, gallina * XXII et priore libro X = XXXII, ovis

book 35 = 60, wool-washings 20 and in last book 32 = 52, mules 5 and in last book 1 = 6, horses 3 and in last book 1 = 4; dog 41 and in last book 16 = 57, mad dog 2 and in last book 3 = 5, ferret 1, mouse 28 and in last book 14 = 62, shrewmouse 1 and in last book 4 = 5, dormouse 6 and in last book 2 = 8, shrew-mouse 2 and in last book 1 = 3, weasel 25 and in last book 19 = 44, newt 12 and in last book 4 = 16, hedgehog 13 and in last book 5 = 18, porcupine 2 and in last book 1 = 3, lizard 30 and in last book 13 = 43, salamander 3 and in last book 1 = 4, snail 19 and in last book 27 = 46 (xliii the drug 'everlasting'), viper 3 and in last book 1 = 4, snake 6 and in last book 4 = 10, viper 21 and in last book 14 = 35, serpent 27 and in last book 8 = 35, bova 3 and in last book 4 = 7, water snake 2 and in last book 1 = 3, Libyan snake 3, remaining serpents 7 and in last book 8 = 15, scorpion 2 and in last book 9 = 36, cricket 3, phryganion 1, scolopendra or multipede or millepede or centipede or woodlouse or catkin 20 and in last book 1 = 21 (admiration for nature who produces nothing useless), slug 3 and in last book 1 = 4, caterpillar 2 and in last book 1 = 3, earthworm 20 and in last book 2 = 22, tree-worm 4 and in last book 1 = 5, grass-worm 8, herpes 1, tick 3; from birds, eagle 3 and in last book 4 = 7, vulture 7 and in last book 9 = 16, lämmergeier 6, cock 35 and in last book 21 = 56, hen 22 and in last book 10 = 32,

[1] ἀκεράτων, *Mayhoff.*

XLIII et priore libro XXII = LXV, Commageno V et priore libro * IV = * IX, cygno V et priore libro I = VI, otide II, corvo IV et priore libro II = VI, cornice II et priore libro I = III, accipitre II et priore libro II = IV, milvo VI et priore libro II = VIII, grue I, ciconia I et priore libro II = III, ibide III, ardiola I, anate IV et priore libro II = VI, mergo II, perdice XI et priore libro VI = XVII, palumbe XIV et priore libro * II = * XVI, galerita IV, cuculo I, pico Martio I, turture V et priore libro IV = IX, turdis III, merula I, hirundine XXIV et priore libro IX = XXXIII, noctua V et priore libro IV = IX, ulula I et priore libro I = II, upupa I, bubone V et priore libro II = VII, passere V, galgulo II, vespertilione IX et priore libro IV = XIII, cicadis I, apibus VII et priore libro V = XII, vespis II, bupresti III et priore libro III = VI, pityocampis IV et priore libro II = VI, (naturae benignitatem et foedis animalibus inseruisse magna remedia.) scarabaeo VII et priore libro I = VIII, blatta XIII et priore libro IV = XVII. de genere cantharidum: medicinae ex his XI et priore libro V = XVI, cimice V et priore libro IX = XIV, musca V et priore libro * VII = XII, locustis III et priore libro IV = VII, formicis V et priore libro III = VIII. Summa: medicinae et historiae et observationes DCCCLIV.

Ex auctoribus: M. Varrone, Nigidio, M. Cicerone, Sextio Nigro qui Graece scripsit, Licinio Macro. Externis: Eudoxo, Aristotele, Hermippo, Homero, Apione, Orpheo, Democrito, Anaxilao. Medicis: Botrye, Apollodoro, Menandro, Archedemo, Aristogene, Xenocrate, Diodoro, Chrysippo, Philippo, Oro, Nicandro, Apollonio Pitanaeo.

eggs 43 and in last book 22 = 65, Syrian cock 5 and in last book 4 = 9, swan 5 and in last book 1 = 6, otis 2, raven 4 and in last book 2 = 6, crow 2 and in last book 1 = 3, hawk 2 and in last book 2 = 4, kite 6 in last book 2 = 8, crane 1, stork 1 and in last book 2 = 3, ibis 3, little heron 1, duck 4 and in last book 2 = 6, diver 2, partridge 11 and in last book 6 = 17, dove 14 and in last book 2 = 16, crested lark 4, cuckoo 1, Mars's woodpecker 1, turtledove 5 and in last book 4 = 9, thrush 3, blackbird 1, swallow 24 and in last book 9 = 33, night-owl 5 and in last book 4 = 9, screech-owl 1 and in last book 1 = 2, hoopoe 1, horned owl 5 and in last book 2 = 7, sparrow 5, galgulus 2, bat 9 and in last book 4 = 13, tree cricket 1, bees 7 and in last book 5 = 12, wasps 2, cowfly 3 and in last book 3 = 6, pine-grub 4 and in last book 2 = 6 (that the beneficence of nature has placed powerful remedies even in disgusting animals), beetle 7 and in last book 1 = 8, cockroaches 13 and in last book 4 = 17; the genus Spanish fly—drugs from these 11 and in last book 5 = 16, bug 5 and in last book 9 = 14, house-fly 5 and in last book 7 = 12, locusts 3 and in last book 4 = 7, ants 5 and in last book 3 = 8.—Total 854 drugs, investigations and observations.

Authorities: Marcus Varro, Nigidius, Marcus Cicero, Sextius Niger (Greek works of), Licinius Macer. Foreign authorities: Eudoxus, Aristotle, Hermippus, Homer, Apion, Orpheus, Democritus, Anaxilaus. Medical writers: Botrys, Apollodorus, Menander, Archidemus, Aristogenes, Xenocrates, Diodorus, Chrysippus, Philippus, Orus, Nicander, Apollonius of Pitane.

Libro XXXI. continentur medicinae ex aquatilibus. (i) aquarum mirabilia. (ii) aquarum differentiae. (iii–xvi) medicinae: observationes CCLXVI: quales oculis aquae prosint, quales fecunditatem faciant, quales insaniae medeantur, quales calculosis, quales volneribus, quales partum custodiant, quales vitiliginem tollant, quae colorem lanis faciant, quae hominibus, quae memoriam, quae oblivionem, quae sensus subtilitatem, quae tarditatem, quae canoram vocem, quae vini taedium, quae inebrient, quae olei vicem praestent, quae salsae et amarae; saxa egerentes, risum aut ploratum facientes, quae amorem sanare dicantur. (xvii) per triduum calentes haustus. (xviii–xx) aquarum miracula: in quibus omnia mergantur, in quibus nihil; aquae necantes, pisces venenati; quae lapideae fiant aut lapidem faciant. (xxi–iii) de salubritate aquarum; de vitiis aquarum; probatio aquarum. (xxiv f.) de aqua Marcia; de aqua Virgine. (xxvi–ix) aquas inveniendi ratio; signa aquarum; differentia aquarum per genera terrae; ratio aquarum per tempora anni. (xxx) aquarum subito nascentium aut desinentium observatio historica. (xxxi) ratio aquae ducendae. (xxxii f.) quomodo medicatis utendum et ad quae genera valetudinum; item marinis XXIX. quid prosit navigatio V. (xxxiv–vi) quomodo marina aqua in mediterraneis fieri possit I, quomodo thalassomeli I, quomodo hydromeli I. (xxxvii f.) remedium contra peregrinas aquas; ex musco medicinae VI; medicinae ex harenis. (xxxix–xlv) de salis generibus et confecturis et medicinis observationes CCIV; de salis auctoritate

Book XXXI. Contents: drugs obtained from aquatic animals. (i) Remarkable facts as to waters. (ii) Differences in waters. (iii–xvi) Medicinal properties: 266 observations; what sorts of waters are good for the eyes, what sorts produce fertility, what sorts cure insanity, what sorts gall-stone, what sorts wounds, what sorts protect the embryo, what sorts remove tetter, which make dye for wools, which for human beings, which produce memory, which forgetfulness, which keenness of sense, which slowness, which a musical voice, which dislike of wine, which intoxication, which fill the place of oil, which are salt and bitter; springs discharging rocks, springs that cause laughter or weeping, springs said to cure love. (xvii) Water keeping hot for three days after being drawn. (xviii–xx) Remarkable waters: waters in which all objects sink, in which no objects; waters that kill, poisonous fishes; waters that turn into stone, or produce stones. (xxi–iii) Health-giving property of waters; impurities of waters; mode of testing waters. (xxiv f.) The Marcian Spring, the Maiden Spring. (xxvi–ix) Method of finding water; signs of springs; differences of waters according to kinds of earth; variation of springs with the seasons. (xxx). Historical account of springs suddenly arising or stopping. (xxxi) Method of carrying water in pipes. (xxxii f.) Medicinal waters, mode of employing, for what kinds of illnesses; *ditto* sea-water, 29 kinds. Benefits of a voyage, 5. (xxxiv–vi) Sea-water at places inland, 1 method of producing, sea-water-honey 1, water-honey 1. (xxxvii f.) Remedy against foreign waters; 6 drugs from moss; drugs from sands. (xxxix–xlv) Salt, kinds of, preparations and drugs from, 204 observations; historical importance

historica CXX; spuma salis; flos salis XX, salsugo II; de garo XV; de muria XV; de allece VIII; de natura salis. (xlvi f.) de nitri generibus et confecturis et medicinis observationes CCXXI; de spongeis medicinae et observationes XCII. Summa: medicinae et historiae et observationes DCCCCXXIV.

Ex auctoribus: M. Varrone, Cassio Parmense, Cicerone, Muciano, Caelio, Celso, Trogo, Ovidio, Polybio, Sornatio. Externis: Callimacho, Ctesia, Eudico, Theophrasto, Eudoxo, Theopompo, Polyclito, Iuba, Lyco, Apione, Epigene, Pelope, Apelle, Democrito, Thrasyllo, Nicandro, Menandro comoedo, Attalo, Sallustio, Dionysio, Andrea, Nicerato, Hippocrate, Anaxilao.

Libro XXXII. continentur medicinae ex aquatilibus. (i–iv) summa naturae vis in antipathia. de echeneide II, de torpedine VII, de lepore marino V; mirabilia rubri maris. (v–ix) de ingeniis piscium; proprietates piscium mirabiles; ubi responsa dentur ex piscibus, ubi ex manu edant, ubi vocem agnoscant, ubi amari sint, ubi salsi, ubi dulces, ubi non muti; esse et locorum sympathiam et antipathiam. (x) quando marini pisces in usu P. R. esse coeperint. Numae regis constitutio de piscibus. (xi) de curalio medicinae et observationes XLIV. (xii) de discordia inter se marinorum, pastinaca IX, galeo, mullo XV. (xiii–xx) de iis quibus in aqua et in terra victus est: de castoreis medicinae et observationes LVI, de testudine medicinae et observationes LXVI, aurata IV, stella marina VII, dracone marino III, salsamento XXV, sardis I, cybia; rana marina VI, fluviatiles LII, rana rubeta; observationes circa eas XXXII; enhydris VI, cancri fluviatiles XIV, cancri marini VII, cocleae fluviatiles VII, coracini IV, porco pisce II,

of salt 120; froth of salt; flower of salt 20; brine 2; fish-sauce 15; pickle 15; fish-brine 8; nature of salt. (xlvi f.) Native soda, kinds of, preparations and drugs from—221 observations; sponges, 92 drugs from and observations—Total 924 drugs, investigations and observations.

Authorities: Marcus Varro, Cassius of Parma, Cicero, Mucianus, Caelius, Celsus, Trogus, Ovid, Polybius, Sornatius. Foreign authorities: Callimachus, Ctesias, Eudicus, Theophrastus, Eudoxus, Theopompus, Polyclitus, Juba, Lycus, Apion, Epigenes, Pelops, Apelles, Democritus, Thrasyllus, Nicander, comedies of Menander, Attalus, Sallustius, Dionysius, Andreas, Niceratus, Hippocrates, Anaxilaus.

Book XXXII. Contents—drugs from aquatic animals. (i–iv) Nature's supreme force in antipathy. The sucking-fish, 2 cases; the electric ray, 7 cases; the sea-hare, 5 cases; marvels of the Red Sea. (v–ix) Intellect of fishes; remarkable properties of fishes; places where oracles are given from fishes, where fishes eat out of the hand, where they recognize the voice, where they are bitter, where salt, where sweet, where not dumb; their sympathy and also antipathy for localities. (x) Sea-fish when first used by the Roman nation. King Numa's regulation as to fish. (xi) Coral, drugs from and observations as to, 66. (xii) Discord between marine animals: sting-ray 9, dog-fish, mullet 15. (xiii–xx) Amphibious animals: beaver-castors, drugs from and observations as to, 56; tortoise, drugs and observations 66; gilt-bream 4, star-fish 7, sea-snake 3, salt fish 25, sardines 1, tunnies, sea-frog 6, river-frog 52, bramble-toad; observations about them 32; water-snake 6, river-crabs 14, sea-crabs 7, river-snails 7, crow-fish 4, pig-

vitulo marino X, murena I, hippocampo IX, echinis XI. (xxi–xxx) ostreorum genera et observationes et medicinae LIX, purpura IX, alga marina II, mus marinus II, scorpio marinus XII, sanguisugae VI, murices XIII, conchylia V, piscium adeps II, callionymi III, coracini fel I, sepiae XXIV, ichthyocolla V, batia I, bacchus sive myxon II, marini peduculi II, canicula IV, cetum I, delphinus IX, coluthia sive coryphia III, alcyoneum VII, thynnus V, maenae XIII, scolopendra II, saurus I, conchis I, silurus XV, strombus sive concha longa VI, tethea V. (xxxi–lii) holus marinum I, myaces XXV, mituli VIII, pelorides I, seriphum II, erythinis II, solea pisce I, rhombo I, blendia I, urtica marina VII, pulmo marinus VI, onyches IV. ex colubra aquatica I, ex hydro I, mugile I, ex pelamyde IV, sciaena I, perca IV, ex squatina III, zmarides III, ophidio I, ex fibro IV, bryon I, ex asello pisce I, phagro I, ex balaena I, polypo I. ex glano I, glaucisco I, rubellio I, uva marina I, anguilla I, hippopotamio I, crocodilo I, adarca sive calamochnus III, calamo VIII. (liii) animalium omnium in mari viventium nomina CLXXVI. Summa: medicinae et historiae et observationes DCCCCXC.

Ex auctoribus: Licinio Macro, Trebio Nigro, Sextio Nigro qui Graece scripsit, Ovidio poeta, Cassio Hemina, Maecenate, Iaccho, Sornatio. Externis: Iuba, Andrea, Salpe, Apione, Pelope, Apelle, Thrasyllo, Nicandro.

Libro XXXIII. continentur metallorum nuturae. (ii–xii) de auro: quae prima commendatio eius; de anulorum aureorum origine; de modo auri apud antiquos; de equestri ordine, de iure anulorum aureorum, de decuriis iudicum; quotiens nomen

fish 2, sea-calf 10, lamprey 1, sea-horse 9, sea-urchins 11. (xxi–xxx) Shellfish: kinds, observations and drugs 59, purple dye 9; seaweed 2, sea-mouse 2, sea-scorpion 12, leeches 6, purple-fishes 13, mussels 5, fishes' fat 2, callyonymi 3, crow-fish's gall 1, cuttle-fish 24, huso sturgeon 5, batia 1, bacchus or myxon 2, sea-lice 2, sea-bitch 4, seal 1, dolphin 9, sea-snail or murex 3, sea-foam 7, tunny 5, maena 13, scolopendra 2, lizard 1, conchis 1, sheat-fish 15, sea-snail or longmussel 6, sponge 5. (xxxi–lii) Sea-cabbage 1, myax mussel 25, sea-mussels 8, giant mussels 1, seriphus fish 2, sea-mullet 2, sole-fish 1, turbot 1, blendia 1, sea-nettle 7, sea-lung 6, scallops 4; from the water-snake 4, from the water-serpent 1, mullet 1, from the young tunny 4, grayling 1, perch 4, from the skate 3, zmarides 3, conger 1, beaver 4, moss 1, haddock 1, phager 1, from the whale 1, polypus 1, shad 1, blue-fish 1, rudd 1, sea-grape 1, eel 1, river-horse 1, crocodile 1, adarca or sea-foam 3, rush 8. (liii) Names of all animals living in the sea 176.—Total: 990 drugs, investigations and observations.

Authorities: Licinius Macer, Trebius Niger, Sextius Niger (Greek writings of), the poet Ovid, Cassius Hemina, Maecenas, Iacchus, Sornatius. Foreign authorities: Juba, Andreas, Salpes, Apion, Pelops, Apelles, Thrasyllus, Nicander.

Book XXXIII. Contents: the properties of the metals. (ii–xii) Gold, what first caused it to be valued; origin of gold rings; limited amount of gold among the ancients; the equestrian order, its right of wearing gold rings; its panels of judges; how

equestris ordinis mutatum; de donis militaribus aureis et argenteis; quando primum corona aurea data; de reliquo usu auri, feminarum. (xiii–xxv) de nummo aureo; quando primum signatum aes, argentum, aurum; antequam signaretur, quis mos in aere; quae maxima pecunia primo censu; quotiens et quibus temporibus aucta sit aeris et nummi signati aestimatio; de cupiditate auri; qui plurimum auri et argenti possederint; quando primum argenti apparatus in harena, quando in scaena; quibus temporibus plurimum in aerario populi Romani auri et argenti fuerit; quando primum lacunaria inaurata; quibus de causis praecipua auctoritas auro; ratio inaurandi; de inveniendo auro; de auripigmento; de electro; primae aureae statuae; medicinae ex auro VIII. (xxvi–ix) de chrysocolla: ratio eius in picturis; medicinae ex chrysocolla VII; de aurificum chrysocolla sive santerna. (xxx) mirabilia naturae glutinandis inter se et perficiendis metallicis rebus. (xxxi–v) de argento; de argento vivo; de stimi sive stibi sive alabastro sive larbasi sive platyophthalmo; medicinae sive ex eo VII; de scoria argenti; medicinae ex ea VI; de spuma argenti; medicinae ex ea VII. (xxxvi–xli) de minio; quam religiosum apud antiquos fuerit; de inventione eius et origine; de cinnabari; ratio eius in medicina et in picturis; genera mini, ratio eius in picturis, in medicina; de hydrargyro. (xlii f.) de argento inaurando; de coticulis aurariis. (xliv–lv) argenti genera et experimenta: de speculis; de Aegyptio argento; de inmodica pecunia; quorum maximae opes fuerint; quando primum populus Romanus stipem sparserit; de luxuria in vasis argenteis; frugalitatis antiquae in argento exempla;

often the title 'equestrian order' altered; gold and silver military gifts; gold wreath, when first bestowed; other uses of gold, its use by women. (xiii–xxv) Gold coinage; date of earliest coins, copper, silver, gold; method of using copper before introduction of stamping; highest money rating at first census; how often and at what dates value of copper and stamped coinage raised; the lust for gold; largest owners of silver and gold; date of earliest employment of silver ornaments in the arena, and on the stage; dates of largest accumulations of gold and silver in the national treasury; date of earliest gilded ceilings; reasons for special value of gold; method of gilding; discovery of gold; orpiment; synthetic amber; earliest gold statues; 8 drugs from gold. (xxvi–ix) malachite, method of employing it in painting; 7 drugs from malachite; goldsmith's malachite or mountain-green. (xxx) Remarkable natural facts as to the welding of metals and as to metal manufactures. (xxxi–v) Silver; quicksilver; antimony or stibis or alabaster or larbasis or platyopathalmus, drugs made of, 7; silver slag, drugs made of, 6; foam of silver, drugs made of, 7. (xxxvi–xli) Minimum, reverence for among the ancients; discovery and source of; cinnabar, method of using in medicine and in painting; kinds of red-lead; method of use in medicine and painting; watersilver. (xliii f.) Gilding of silver; touchstones for gold. (xliv–lv) Silver, its kinds and methods of testing; mirrors; Egyptian silver; immoderate wealth; who were the richest people; when did the Roman nation begin to squander money; luxury in silver vessels; sparing use of silver in antiquity, instances of;

quando primum lectis argentum additum; quando lances immodicae factae; quando repositoriis argentum additum, quando tympana facta; inmodica argenti pretia; de statuis argenteis; nobilitates operum et artificum in argento. (lvi–lviii) de sile; qui primi sile pinxerint et qua ratione; de caeruleo; medicinae ex eo II. Summa: medicinae et historiae et observationes CCLXXXVIII.

Ex auctoribus: Domitiano Caesare, Iunio Gracchano, L. Pisone, M. Varrone, Corvino, Attico Pomponio, Calvo Licinio, Cornelio Nepote, Muciano, Boccho, Fetiale, Fenestella, Valerio Maximo, Iulio Basso qui de medicina Graece scripsit, Sextio Nigro qui item. Externis: Theophrasto, Democrito, Iuba, Timaeo historico qui de medicina metallica scripsit, Heraclide, Andrea, Diagora, Botrye, Archedemo, Dionysio, Aristogene, Democle, Mneside, Attalo medico, Xenocrate item, Theomnesto, Nymphodoro, Iolla, Apollodoro, Pasitele qui mirabilia opera scripsit, Antigono qui de toreutice scripsit, Menaechmo qui item, Xenocrate qui item, Duride qui item, Menandro qui de toreutis, Heliodoro qui de Atheniensium anathematis scripsit, Metrodoro Scepsio.

Libro XXXIV. continentur: aeris metalla. (ii–x) genera aeris; quae Corinthia, quae Deliaca, quae Aeginetica. de tricliniis aereis, de candelabris; de templorum ornamentis ex aere; quod primum dei simulacrum Romae ex aere factum; de origine statuarum et honore. (x–xix) statuarum genera et figurae. antiquas statuas togatas sine tunicis fuisse; quae primae statuae Romae, quibus primum publice positae, quibus primum in columna; quando rostra; quibus externis Romae publice positae, quibus Romae mulieribus in publico positae,

date of earliest use of silver inlay on couches, of silver vessels of excessive size, of trays inlayed with silver, of making 'drums'; excessive prices for silver; silver statuary; famous works of art and artists in silver. (lvi–lviii) Of yellow ochre, who first used for painting and how. Steel blue; drugs made from, 2.—Total 288 drugs, investigations and observations.

Authorities: the Emperor Domitian, Junius Gracchanus, Lucius Piso, Marcus Varro, Corvinus, Pomponius Atticus, Licinius Calvus, Cornelius Nepos, Mucianus, Bocchus, Fetialis, Fenestella, Valerius Maximus, Julius Bassus, Greek medical writings of, Sextius Niger, *ditto.* Foreign authorities: Theophrastus, Democritus, Juba, the historian Timaeus's *Mineral Drugs*, Heraclides, Andreas, Diagoras, Botrys, Archedemus, Dionysius, Aristogenes, Democles, Mnesides, Attalus the medical writer, Xenocrates *ditto*, Theomnestus, Nymphodorus, Iollas, Apollodorus, Pasiteles's *Masterpieces*, Antigonus *On Graving*, Menaechmus *ditto*, Xenocrates *ditto*, Duris *ditto*, Menander *On Gravers*, Heliodorus's *Votive Offerings of Athens*, Metrodorus of Scepsis.

Book XXXIV. Contents: (i) Copper metals. (ii–x) Kinds of copper—Corinthian, Delian, Aeginetan. On bronze dining-couches; on candelabra; on temple decorations of bronze; first bronze image of a god made at Rome; on the origin of statues and the reverence paid to them. (x–xix) Statues, their kinds and shapes. Ancient statues dressed in toga without tunic; the first statues at Rome, the first erected by the state, the first erected on a column; ship's beaks, when added; first foreigners to whom statues erected by the state at Rome; first women to

quae prima Romae statua equestris publice posita; quando omnes privatim positae statuae ex publico sublatae; quae prima ab externis publice posita; fuisse antiquitus et in Italia statuarios; de pretiis signorum inmodicis; de colossis in urbe celeberrimis; nobilitates ex aere operum et artificum CCCLXVI. (xx–xxix) differentiae aeris et mixturae; de pyropo, de Campano aere; de servando aere; de cadmia; medicinae ex ea XV; aeris usti effectus in medicina X; de scoria aeris, de flore aeris, squama aeris, stomomate aeris: medicinae ex his XLVII; aerugo: medicinae ex ea XVIII; hieracium; scolex aeris; medicinae ex eo XVIII; de chalcitide; medicinae ex ea VII; psoricon. (xxx–xxxviii) sory; medicinae ex eo III; misy: medicinae ex eo XIV; chalcanthum sive atramentum sutorium: medicinae ex eo XVI; pompholyx, spodium: medicinae ex eis VI; antispodi genera XV; smegma; de diphryge; de triente Servilio. (xxxix–xlvi) de ferri metallis: simulacra ex ferro; caelaturae ex ferro; differentiae ferri; de ferro quod vivum appellant; ferri temperatura; robiginis remedia; medicinae ex ferro VII; medicinae ex robigine XIV; medicinae ex squama ferri XVII; hygremplastrum. (xlvii–lvi) de plumbi metallis: de plumbo albo; de argentario, de stagno; de plumbo nigro; medicinae ex plumbo XV; medicinae ex scoria plumbi XV; spodium ex plumbo; de molybdaena; medicinae ex ea XV; psimythium sive cerussa: medicinae ex ea VI; sandaraca: medicinae ex ea XI; arrenicum. Summa: medicinae CCLVII; ex iis ad canis morsus, ad caput, alopecias, oculos, aures, nares, oris vitia, lepras, gingivas, dentes, uvam, pituitam, fauces, tonsillas, anginam, tussim, vomi-

whom statues so erected; first equestrian statue erected by the state at Rome; date of removal from public places of all statues erected by private donors; first statue publicly erected by foreigners; existence of sculptors from early times even in Italy; excessive prices for statues; the most celebrated colossal statues in the city; 366 famous instances of bronze statues and sculptors in bronze. (xx–xxix) Different kinds of bronze and alloy; gold-bronze, Capuan bronze; preservation of bronze; cadmia, 15 drugs made from; melted bronze, 10 medicinal products of; copper slag, copper blisters, copper scales, copper flakes, 47 drugs from these; copper rust, 18 drugs from; eye-salve; worm-eaten bronze, 18 drugs from; copper ore, 7 drugs from; itch-salve. (xxx–xxxviii) Ink-stone, 3 drugs from; copperas, 14 drugs from; copperas water or shoe-maker's blacking, 16 drugs from; pompholyx, slag, 6 drugs from these; slag-ashes, 15 kinds; skin-detergent; diphryx; the Servilian family's magic sixpence. (xxxix–xlvi) Iron mines; iron statues; chased iron; different kinds of iron; 'live iron'; the tempering of iron; remedies for rust; 7 drugs from iron; 14 drugs from rust; 17 drugs from iron scale; wet plaster. (xlvii–lvi) Lead mines; white lead; silver-lead, stannum, black lead; 15 drugs from lead; 15 drugs from lead slag; dross from lead; molybdaena, 15 drugs from; sugar of lead or cerussa, 6 drugs from; sandarach, 11 drugs from; arsenic.—Total, 257 drugs, including remedies for dog-bite, for the head, fox-mange, eyes, ears, nostrils, ailments of the mouth, leprosy, gums, teeth, uvula, phlegm, throat, tonsils, quinsy, cough, vomiting, chest, stomach, asthma, pains in the side, spleen, stomach,

tiones, pectus, stomachum, suspiria, lateris dolores, splenem, ventrem, tenesmum, dysenteriam, sedem, verenda, sanguinem sistendum, podagras, hydropicos, ulcera, volnera XXVI, suppurata, ossa, paronychia, ignem sacrum, haemorroidas, fistulas, callum, pusulas, scabiem, cicatrices, infantes, muliebria vitia, psilotrum, Venerem inhibendam, ad vocem, contra lymphationes. summa: res et historae et observationes DCCCCXV.

Ex auctoribus: L. Pisone, Antiate, Verrio, M. Varrone, Cornelio Nepote, Messala Rufo, Marso poeta, Boccho, Iulio Basso qui de medicina Graece scripsit, Sextio Nigro qui item, Fabio Vestale. Externis: Democrito, Metrodoro Scepsio, Menaechmo qui de toreutice scripsit, Xenocrate qui item, Antigono qui item, Duride qui item, Heliodoro qui de Atheniensium anathematis scripsit, Pasitele qui de mirabilibus operibus scripsit, Timaeo qui de medicina metallica scripsit, Nymphodoro, Iolla, Apollodoro, Andrea, Heraclide, Diagora, Botrye, Archedemo, Dionysio, Aristogene, Democle, Mneside, Xenocrate Zenonis, Theomnesto.

Libro XXXV. continentur: (i–x) Honos picturae, honos imaginum. quando primum clipei imaginum instituti: quando primum in publico positi; quando in domibus. de picturae initiis, de monochromatis picturis, de primis pictoribus. antiquitas picturarum in Italia. de pictoribus Romanis. quando primum dignitas picturae et quibus ex causis Romae, qui[1] victorias suas pictas proposuerint. quando primum externis picturis dignitas Romae. (xi) ratio pingendi. (xii–xxx) de pigmentis praeter metallica. de coloribus ficticiis; de Sinopide; medicinae ex ea XI; de rubrica; de terra Lemnia;

straining, dysentery, the seat, the private parts, blood-stanching, gout, dropsy, ulcers, 26 wounds, pus, bones, whitlows, erysipelas, haemorrhoids, ulcers, callus, pimples, mange, scars, infants, ailments of women, depilatory, sex restraint, for the voice, against attacks of frenzy—Total, 915 facts, investigations and observations.

Authorities: Lucius Piso, Antias, Verrius, Marcus Varro, Cornelius Nepos, Rufus Messala, the poet Marsus, Bocchus, Julius Bassus's Greek treatise on medicine, Sextius Niger's *ditto*, Fabius Vestalis. Foreign authorities: Democritus, Metrodorus of Scepsis, Menaechmus's *Art of Graving*, Xenocrates *ditto*, Antigonus *ditto*, Duris *ditto*, Heliodorus's *Votive Offerings of Athens*, Pasiteles's *Masterpieces*, Timaeus's *Mineral Drugs*, Nymphodorus, Iollas, Apollodorus, Andreas, Heraclides, Diagoras, Botrys, Archedemus, Dionysius, Aristogenes, Democles, Mnesides, Xenocrates son of Zeno, Theomnestus.

Book XXXV. Contents: (i–x) Praise of painting. Praise of sculpture. Shields with sculptured figures, when first instituted; when first set up in public; when in private houses. The commencement of painting; pictures in monochrome; the first painters. Antiquity of paintings in Italy. Roman painters. Painting—when first esteemed at Rome, and for what reasons, who first exhibited paintings of their victories. Foreign pictures, when first valued at Rome. (xi) Method of painting. (xii–xxx) Non-mineral pigments. Artificial colours; red ochre, 11 drugs from it; red chalk; Lemnian

[1] qui primi? *Rackham.*

medicinae ex ea IX; de Aegyptia terra; de ochra; medicinae ex rubrica III; leucophorum; Paraetonium. Melinum; medicinae ex eo VI; cerussa usta; Eretria terra, medicinae ex ea VI; sandaraca; sandyx; Syricum; atramentum; purpurissum; Indicum: medicinae ex eo IV; Armenium, medicina ex eo I; viride Appianum; anulare. (xxxi–iii) qui colores udo non inducantur. quibus coloribus antiqui pinxerint. quando primum gladiatorum pugnae pictae et propositae sint. (xxxiv–xli) de aetate picturae; operum et artificum in pictura nobilitates CCCCV, picturae primum certamen; qui penicillo pinxerint; de avium cantu conpescendo; qui encausto aut ceris vel cestro vel penicillo pinxerint. quae quis primus invenerit in pictura; quid difficillimum in pictura; de generibus picturae; quis primus lacunaria pinxerit, quando primum camarae pictae; pretia mirabilia picturarum; de talento. (xliii–xlvi) plastices primi inventores; quis primus ex facie imaginem expresserit; nobilitates artificum in plastice XIV. de figlinis operibus; de Signinis. (xlvii–lix) terrae varietates; de pulvere Puteolano et aliis terrae generibus quae in lapidem vertuntur; de parietibus formaceis; de latericiis et de laterum ratione; de sulpure et generibus eius; medicinae XIV; de bitumine et generibus eius; medicinae XXVII; de alumine et generibus eius; medicinae ex eo XXXVIII; de terra Samia; medicinae ex ea III; Eretriae terrae genera; de terra ad medicinam lavanda; de Chia terra: medicinae ex ea III; de Selinusia; medicinae ex ea III; de pnigitide; medicinae ex ea IX; de ampelitide; medicinae ex ea IV; cretae ad vestium usus; cimolia: medicinae ex ea IX; Sarda, Umbrica, saxum; argentaria;

earth, 9 drugs from it; Egyptian earth; yellow ochre; 3 drugs from red ochre; gold size; Paraetonium white; Melian white; 6 drugs from it; burnt white-lead; earth of Eretria, 6 drugs from it; sandarach; vermilion; Syrian; black ink; dark purple ink; indigo, 4 drugs from it; ultramarine, 1 drug from it; Appian green; signet-ring white. (xxxi–iii) Colours that cannot be painted on a damp surface. Colours used by painters of early dates. When battles of gladiators were first painted and exhibited. (xxxiv–xli) The antiquity of painting; 405 celebrated cases of paintings and artists; earliest painting competition; painters that used the brush; how to check the song of birds; what painters used encaustic or waxes or graver or brush; inventors of successive improvements in painting; the most difficult thing in painting; kinds of painting; first painter of panelled ceilings; vaulted roofs, when first painted; remarkable prices for pictures; the talent. (xliii–xlvi) The first discoveries of modelling; who first took a mould of a face; 14 celebrated cases of artists in modelling; works in pottery; Segni plaster. (xlvii–lix) Varieties of earth: Pozzuoli dust and other kinds of earth used for concrete; walls cast in moulds; brickwork and employment of brick; brimstone and its kinds; 14 drugs; bitumen and its kinds; 27 drugs; alum and its kinds; 38 drugs therefrom; Samian earth; 3 drugs therefrom; Eretrian earth, its kinds; on washing earth to make a drug; Chian earth; 3 drugs therefrom; earth of Selinunte; 3 drugs therefrom; potters' clay; 9 drugs therefrom; vine-earth; 4 drugs therefrom; chalks for use in connexion with clothes; earth of Kimolo; 9 drugs therefrom; earth of Sardis, of Umbria, rock;

qui et quorum liberti praepotentes; terra ex Galata, terra Clupea, terra Baliarica, terra Ebusitana: medicinae ex eis IV. Summa: medicinae et historiae et observationes DCCCCLVI.

Ex auctoribus: Messala oratore, Messala sene, Fenestella, Attico, M. Varrone, Verrio, Nepote Cornelio, Deculone, Muciano, Melisso, Vitruvio, Cassio Severo, Longulano, Fabio Vestale qui de pictura scripsit. Externis: Pasitele, Apelle, Melanthio, Asclepiodoro, Euphranore, Parrhasio, Heliodoro qui de anathematis Atheniensium scripsit, Metrodoro qui de architectonice scripsit, Democrito, Theophrasto, Apione grammatico qui de metallica medicina scripsit, Nymphodoro, Iolla, Apollodoro, Andrea, Heraclide, Diagora, Botrye, Archedemo, Dionysio, Aristogene, Democle, Mneside Xenocrate Zenonis, Theomnesto.

Libro XXXVI. continentur naturae lapidum. (i–xi) luxuria in marmoribus: quis primus peregrino marmore columnas habuerit Romae; quis primus in publicis operibus ostenderit; qui primi laudati in marmore scalpendo et quibus temporibus (ix de Mausoleo Cariae); nobilitates operum et artificum in marmore CCXXV; quando primum marmorum in aedificiis usus; qui primi marmora secuerint et quando; quis primus Romae crustaverit parietes; quibus aetatibus quaeque marmora in usum venerint Romae; ratio secandi marmora; de harenis quibus secantur; de Naxio, de Armenio; de Alexandrinis marmoribus. (xii f.) de onyche, de alabastrite: medicinae ex eis VI; de lygdino, corallitico, Alabandico, Thebaico, Syenite. (xiv f.) de obelisicis: de eo qui pro gnomone in campo Martio est. (xvi–xxiii) opera mirabilia in terris: Sphinx Aegyptia, pyra-

rotten-stone; what people and whose freedmen are excessively powerful; Galatian earth, Kalibian earth, Balearic earth, Iviza earth; 4 drugs from these.—Total 956 drugs, investigations and observations.

Authorities: the orator Messala, Messala senior, Fenestella, Atticus, Marcus Varro, Verrius, Cornelius Nepos, Deculo, Mucianus, Melissus, Vitruvius, Cassius Severus, Longulanus, Fabius Vestalis *On Painting*. Foreign authorities; Pasiteles, Apelles, Melanthius, Asclepiodorus, Euphranor, Parrhasius, Heliodorus's *Votive offerings of Athens*, Metrodorus's *Science of Architecture*, Democritus, Theophrastus, the philologist Apion's *Mineral Drugs*, Nymphodorus, Iollas, Apollodorus, Andreas, Heraclides, Diagoras, Botrys, Archedemus, Dionysius, Aristogenes, Democles, Mnesides, Xenocrates son of Zeno, Theomnestus.

Book XXXVI. Contents: the natures of stones. (i–xi) Luxury in use of marbles; first owner of foreign marble pillars at Rome; first exhibitor of marble in public works; first distinguished sculptors in marble, and their dates; (ix the Mausoleum of Caria); 225 famous works and artists in marble; date of first employment of marbles in buildings; what people first cut marbles, and at what date; who first used marble wall-panelling at Rome; at which periods did the various marbles come into use at Rome; method of cutting marble; sands employed in marble-cutting; Naxian marble, Armenian marble, marbles of Alexandria. (xii f.) Onyx, alabaster; 6 drugs therefrom; Parian marble, coral marble, Alabanda stone, Theban stone, Syene granite. (xiv f.) Obelisks: obelisk in Campus Martius serving as gnomon. (xvi–xxiii) Remarkable structures in various countries; Egyptian Sphinx, pyramids; Pharos lighthouse;

mides; Pharos; labyrinthi; pensiles horti, pensile oppidum; de templo Ephesiae Dianae; aliorum templorum admirabilia; de lapide fugitivo; echo septiens resonans; sine clavo aedificia. (xxiv) Romae miracula operum XVIII. (xxv–xxx) de magnete lapide: medicinae ex eo III; Syrius lapis; de sarcophago sive Assio: medicinae ex eo X; de chernite, de poro; de lapidibus osseis, de palmatis, de Taenariis, de Coranis, de nigris marmoribus; de molaribus lapidibus; pyritis; medicinae ex eo VII. (xxxi–xl) ostracites: medicinae ex eo IV; amiantus: medicinae ex eo II; geodes: medicinae ex eo III; melitinus: medicinae ex eo VI; gagates: medicinae ex eo VI; spongites: medicinae ex eo II; phrygius; haematites: medicinae ex eo V; schistos: medicinae ex eo VII; androdamas: medicinae ex eo II; Arabicus; miltites sive hepatites, anthracites; aetites, Taphiusius, callimus; Samius: medicinae ex eo VIII. (xli–l) arabus: medicinae ex eo VI; de pumice: medicinae ex eo IX; de mortariis medicinalibus et aliis; Etesius lapis, chalazius; siphnius, lapides molles; lapis specularis; phengites; de cotibus; de tophis; de silicum natura; de reliquis ad structuram lapidibus. (li–lix) genera structurae; de cisternis; de calce; harenae genera, harenae et calcis mixturae; vitia structurae; de tectoriis; de columnis: genera columnarum; medicinae ex calce V; de maltha; de gypso. (lx–lxx) de pavimentis: asarotos oecos; quod primum pavimentum Romae; de subdialibus pavimentis; Graecanica pavimenta: quando primum lithostrotum; quando primum camarae vitreae; origo vitri; genera eius et ratio faciendi; de Obsianis; miracula ignium; medicinae ex igni et cinere III; prodigia foci. Summa:

labyrinths; hanging gardens, hanging town; temple of Diana at Ephesus; remarkable facts as to other temples; runaway stone; sevenfold echo; buildings constructed without clamps. (xxiv) Eighteen remarkable works at Rome. (xxv–xxx) Magnetic stone: 3 drugs therefrom; Syros stone; flesh-eating or Assos stone, 10 drugs therefrom; Chernites marble; tufa; bone-stones, palm-branch stones, Taenarus stones, Cora stones, black marbles; mill-stones; pyritis, 7 drugs therefrom. (xxxi–xl) Oyster-shell stone, 4 drugs therefrom; asbestos, 2 drugs therefrom; earthstone, 3 drugs therefrom; honey-stone; 6 drugs therefrom; jet, 6 drugs therefrom; sponge-stone, 2 drugs therefrom; Phrygian stone; bloodstone, 5 drugs therefrom; schistose, 7 drugs therefrom; *androdamas* bloodstone, 3 drugs therefrom; Arabian stone; minium bloodstone or liverstone, anthracite; eagle-stone, Taphiusian stone, *callimus*; Samos stone, 8 drugs therefrom. (xli–l) Arab stone; 6 drugs therefrom; pumicestone, 9 drugs therefrom; medicinal and other mortars; *Etesius* stone, hailstone stone; Siphnos stone; soft stones; muscovy-stone; selenite; whetstones; tufas; flints, nature of; other building stones. (li–lix) Kinds of building; cisterns; lime; kinds of sand; mixtures of sand and lime; faults in building; stuccos; pillars; kinds of pillars; 5 drugs from chalk; lime-cement; white lime plaster. (lx–lxx) Pavements: the Tesselated Hall; first pavement at Rome; terrace pavements; pavements in the Greek mode; date of first mosaic pavement; date of first glass ceilings; origin of glass; its kinds and mode of manufacture; obsidian panes; remarkable uses of fire; 3 drugs from fire and ash; marvels of the hearth.—Total: 89 drugs

medicinae ex his LXXXIX, ad serpentes III bestiarum morsus, ad venena, caput, oculos, epinyctidas, dentes, dentifricia, fauces, strumas, stomachum, iocinera, pituitam, testes, vesicam, calculos, panos, haemorroidas, podagras, sanguini sistendo, sanguinem reicientibus, luxata; phreneticos, lethargicos, comitiales, melancholicos, vertigines, ulcera, volnera urenda, secanda, convolsa, contusa, maculas, usta, phthisin, mammas, muliebria vitia, carbunculos, pestilentia. Summa omnis: res et historiae et observationes CCCCXXXIV.

Ex auctoribus: M. Varrone, C. Galba, Cincio, Muciano, Nepote Cornelio, L. Pisone, Q. Tuberone, Fabio Vestale, Annio Fetiale, Fabiano, Seneca, Catone censorio, Vitruvio. Externis: Theophrasto, Pasitele, Iuba rege, Nicandro, Sotaco, Sudine, Alexandro polyhistore, Apione Plistonico, Duride, Herodoto, Euhemero, Aristagora, Dionysio, Artemidoro, Butorida, Antisthene, Demetrio, Demotele, Lycea.

Libro XXXVII. continentur: (i–x) origo gemmarum; de Polycratis tyranni gemma; de Pyrrhi gemma; qui scalptores optimi, nobilitates scalpturae; quae prima Romae dactyliothece; gemmae in Pompei Magni triumpho translatae; quando primum murrina invecta; luxuria circa ea; natura eorum; natura crystalli, medicina ex eo: luxuria in crystallo. (xi–xx) de sucino: quae de eo mendacia; genera sucinorum; medicinae ex his; lyngurium: medicinae II; de adamante sive anancite: genera adamantis VI, medicinae II; de zmaragdis: genera eorum XII, vitia eorum; tanos gemma; chalcozmaragdos; de beryllis: genera eorum VIII, vitia eorum. (xxi–xxx) de opalis: genera eorum VII,

from these materials, 3 for serpents, animals' bites, for poisons, for the head, eyes, eyelid sores, teeth, tooth-powders, throat, scrofula, stomach, liver, phlegm, testicles, bladder, stone, tumours, piles, gout, remedy for bleeding, for vomiting blood, dislocation, cases of insanity, of lethargy, of epilepsy, of melancholy, of giddiness, ulcers, caustic and surgical treatment of wounds, sprains, bruises, moles burns, consumption, the breasts, diseases of women, carbuncles, plague. Full total: 434 facts, investigations and observations.

Authorities: Marcus Varro, Gaius Galba, Cincius, Mucianus, Cornelius Nepos, Lucius Piso, Quintus Tubero, Fabius Vestalis, Annius Fetialis, Fabianus, Seneca, Cato the Censor, Vitruvius. Foreign authorities: Theophrastus, Pasiteles, King Juba, Nicander, Sotacus, Sudines, Alexander the Learned, Apion Plistonicus, Duris, Herodotus, Euhemerus, Aristagoras, Dionysius, Artemidorus, Butoridas, Antisthenes, Demetrius, Demoteles, Lyceas.

Book XXXVII. Contents: (i–x) Origin of gems: the tyrant Polycrates's jewel; Pyrrhus's jewel; the best engravers; famous specimens of engraving; the first collection of signet-rings at Rome; jewels carried in the triumph of Pompey the Great; murrine vases, date of first importation; extravagance connected with; their nature; nature of rock-crystal, drug from it; extravagance in use of rock crystal. (xi–xx) Amber, erroneous statements about; kinds of amber, drugs from these; tourmaline, 2 drugs; diamond or anancite, 6 kinds of diamonds, 2 drugs; emeralds, 12 kinds, their blemishes; the gem tanos; malachite; beryls, their 8 kinds, their blemishes. (xxi–xxx) Opals, their 7 kinds, their blemishes, tests

vitia eorum, experimenta eorum; de sardonyche: genera eius, vitia eius; de onyche: genera eius; de carbunculis: genera eorum XII, vitia eorum et experimenta; anthracitis; sandastros sive Garamantitis sive sandacitis, sandaresus; lychnis: genera eius IV; carchedonia. (xxxi–xl) sarda: genera eius V; de topazo: genera eius II; de callaina; de prasio: genera eius III; nilion; molochitis; de iaspide, genera eius XIV, vitia eorum; de cyano: genera eius; de sapphiro; amethysto: genera eius IV; socondion, sapenos, pharanitis, Aphrodites blepharon sive anteros sive paederos. (xli–l) hyacinthus; de chrysolitho genera eius VII; de chryselectro; leucochrysos: genera eius IV; melichrysi, xuthi; paederos sive sangenos sive tenites; asteria; astrion; astriotes; astolon. (li–lx) ceraunia: genera eius IV; baetylos; Iris; hieros; achatae: genera eorum; acopos: medicinae ex ea; alabastritis; medicinae ex ea; alectoriae, androdamas, argyrodamas, antipathes, Arabica, aromatitis, asbestos, aspisatis, atizoe, augitis, amphidanes sive chrysocolla, Aphrodisiaca, apsyctos, Aegyptilla; balanitae, batrachitis, baptes; Beli oculus, Belus, baroptenus sive baripe, botryitis, bostrychitis, bucardia, brontea, boloe; cadmitis, callais, capnitis, Cappadocia, callaica, catochitis, catoptritis, cepitis sive cepolatitis, ceramitis, cinaediae, ceritis, circos, corsoides, coralloachates, corallis, crateritis, crocallis, cyitis, chalcophonos, chelidoniae, cheloniae, chelonitis, chloritis, Choaspitis, chrysolampis, chrysopis, cepionides; daphnea, diadochos, diphyes, Dionysias, dracontitis; encardia sive enariste, enorchis, exhebenus, erythallis, erotylos sive amphicomos sive hieromnemon, eumeces, eumi-

of opals; sardonyx, its kinds, its blemishes; onyx, its kinds; carbuncles, their 12 kinds, their blemishes and tests; coal-carbuncle; sandastros or Garamantitis or sandacitis; sandaresus; lychnis, its 4 kinds; Carthaginian stone. (xxxi–xl) Carnelian, its 5 kinds; chrysolite, its 2 kinds; turquoise; leek-green stone, its 3 kinds; Nile-stone; malachite; jasper, its 4 kinds, their blemishes; lapis lazuli, its kinds; sapphire; amethyst, its 4 kinds; socondion, sapenos, pharanitis, Venus's eyelid or love-returned or lad's-love. (xli–l) Hyacinth; chrysolite, its 7 kinds; golden-amber; chrysolite, its 4 kinds; golden chrysolite; xuthis; lad's-love or sangenos or tenites; cat's-eye; adularia, astriotes, astolon. (li–lx) St. John's bread, its 4 kinds; baetylos; rainbow-stone; holy-stone; agates, their kinds; crystalline quartz, drugs therefrom; alabaster-stone, drugs therefrom; cock-stones, androdamas, silver-stone, charm-coral, chalcedony, scented amber, asbestos-stone, aspisatis, atizoe, turquoise, amphidanes or chrysocolla, Aphrodisiaca, apsyctos, little-gypsy; acorn-stone, frog-stone, baptes, cat's eye, Belus, baroptenus or baripe, grape-stone, lock-of-hair-stone, cow's-heart, thunder-stone, boloe, cadmitis, turquoise, smoke-stone, Cappadocian stone, turquoise-stone, catochitis, catoptritis, cepitis or cepolatitis, brick-stone, cinaedias (kinds of), wax-stone, top-stone, hair-stone, coral-agate, coral-stone, crateritis, crocallis, cyitis, brazen-voice, swallow-stones, tortoise-stones, tortoise-shell-stone, green-stone, Choaspes-stone, gold-gleam, golden-topaz, cepionides, Daphne-stone, diadochos, diphyes, Dionysus-stone, snake-stone, heart-stone or enariste, enorchis, exhebenus, erythallis, erotylos or amphicomos or stone of remembrance, eumeces, eumithres,

thres, eupetalos, eureos, Eurotias, eusebes, epimelas; galaxias, galactitis sive leucogaea sive leucographitis sive synnephitis, gallaica, gassinnade, glossopetra, Gorgonia, goniaea; heliotropion, Hephaestitis, Hermuaedoeon, hexecontalithos, hieracitis, hammitis, Hammonis cornu, hormiscion, hyaeniae, haematitis meniu sive xuthos. (lxi–lxx) Idaei dactyli, icterias, Iovis gemma sive drosolithos, Indica, ion; lepidotis, Lesbias, leucophthalmos, leucopoecilos, libanochrus, limoniatis, liparea, lysimachos, leucochrysos; Memnonia, Media, meconitis, mithrax, morochthos, mormorion sive promnium sive Alexandrinum, myrritis, myrmecias, myrsinitis, mesoleucos, mesomelas; nasamonitis, nebritis, Nipparena; oica, ombria sive notia, onocardia, oritis sive sideritis, ostracias sive ostracitis, ostritis, ophicardelos, Obsiana; panchrus, pangonus, paneros sive panerastos, Ponticae genera IV, phloginos sive chrysitis, phoenicitis, phycitis, perileucos, Paeanitis sive gaeanis; solis gemma, sagda, Samothracia, sauritis, sarcitis, selenitis, sideritis, sideropoecilos, spongitis, synodontitis, Syrtitis, syringitis; trichrus, thelyrrizos, thelycardios sive mucul, Thracia (genera III), tephritis, tecolithos; veneris crines, Veientana; zathene, zmilampis, zoraniscaea. (lxxi–lxxvii) hepatitis, steatitis, Adadu nephros, Adadu ophthalmos, Adadu dactylos, triophthalmos; carcinias, echitis, scorpitis, scaritis, triglitis, aegophthalmos, hyophthalmos, geranitis, aetitis, myrmecitis, cantharias, lycophthalmos, taos, timiclonia; ammochrysos, cenchritis, dryitis, cissitis, narcissitis, cyamias, pyren,

eupetalos, eureos, Eurotas-stone, eusebes, epimelas; milk-stone, milky-stone or white-earth-stone or white graphite or cloud-stone, Galician-stone, gassinades, tongue-stone, Gorgon-stone, goniaea, striped-jasper, Vulcan-stone, Mercury's privates, sixty-colour-stone, hawk-stone, hammitis, ammonite, hormiscion, hyena-stone, meniou bloodstone or yellow-stone. (lxi–lxx) Ida's fingers, icterias, Jove-stone or dew-stone, Indian stone, violet-stone, scale-stone, Lesbian stone, white-eye, white-spot, myrrh-colour, emerald, Lipari-stone, lysimachos, white gold, Memnon-stone, Persian stone, poppy-stone, mithrax, morochthos, mormorion or promnium or Alexandria stone, myrrh-stone, wart-stone, myrrh-stone, white-centre, black-centre, stone of Nasamon, fawn-stone, Nipparena, egg-stone, rain-stone or storm-stone, ass's-heart, mountain-stone or star-stone, hornstone or chalcedony, oyster-stone, ophicardelos, obsidian, all-colours, all-seeds, love-all or all-love, Black Sea stone, 4 kinds, flame-stone or gold-stone, purple-stone, sea-weed-stone, white-ring, Paeanite or gaeanite, sun-stone, green-stone, Samothracian stone, lizard-stone, flesh-stone, moon-stone, iron-stone, variegated iron-stone, sponge-stone, bream-stone, Syrtian stone, reed-stone, tricolor, thelyrrizos, thelycardios or mucul, Thracian-stone (3 kinds), ash-stone, tecolithos, love-locks, Veii-stone, zathene, zmilampis, zoraniscaea. (lxxi–lxxvii) Liver-stone, soapstone, Adad's-kidney, Adad's-eye, Adad's-finger, three-eyed-stone, crab-stone, adder-stone, scorpion-stone, wrasse-stone, triglitis, goat's-eye, sow's-eye, crane-stone, eagle-stone, ant-stone, beetle-stone, wolf's-eye, peacock-stone, timiclonia; gold-sand-stone, millet-stone, oak-stone, ivy stone, narcissus-stone,

phoenicitis, chalazias, pyritis, polyzonos, astrapaea, phlogitis, anthracitis, enygros, polytrichos, leontios, pardalios, drosolithos, melichrus, melichloros, polias, spartopolia, rhoditis, melitis, chalcitis, sycitis, bostrychitis, chernitis, anancitis, synochitis, dendritis; cochlides; de figura gemmarum; ratio probandi. conparatio naturae per terras. conparatio rerum per pretia. Summa: res et historiae et observationes MCCC.

Ex auctoribus: M. Varrone, actis triumphorum Maecenate, Iaccho, Cornelio Boccho. Externis: Iuba rege, Xenocrate Zenonis, Sudine, Aeschylo, Philoxeno, Euripide, Nicandro, Satyro, Theophrasto, Charete, Philemone, Demostrato, Zenothemi, Metrodoro, Sotaco, Pythea, Timaeo Siculo, Nicia, Theochresto, Asaruba, Mnasea, Theomene, Ctesia, Mithridate, Sophocle, Archelao rege, Callistrato, Democrito, Ismenia, Olympico, Alexandro polyhistore, Apione, Oro, Zoroastre, Zachalia.

bean-stone, pyren, purple-stone, hail-stone, pyritis, striped-stone, lightning-stone, flame-stone, coal-stone, enygros, hairy-stone, lion-stone, leopard-stone, dew-stone, honey-colour-stone, honey-yellow-stone, gray-stone, spartopolia, rose-stone, honey-stone, copper-stone, fig-stone, ringlet-stone, ivory-marble, anancitis, synochitis, tree-stone, snail-shell. Shape of precious stones; method of testing; natural properties compared in various countries; products compared in respect of price.—Total, 1300 facts, investigations and observations.

Authorities: Marcus Varro, *Records of Triumphs*, Maecenas, Iacchus, Cornelius Bocchus. Foreign authorities: King Juba, Xenocrates son of Zeno, Sudines, Aeschylus, Philoxenus, Euripides, Nicander, Satyrus, Theophrastus, Chares, Philemon, Demostratus, Zenothemis, Metrodorus, Sotacus, Pytheas, Timaeus of Sicily, Nicias, Theochrestus, Asaruba, Mnaseas, Theomenes, Ctesias, Mithridates, Sophocles, King Archelaus, Callistratus, Democritus, Ismenias, Olympicus, Alexander the Learned, Apion, Orus, Zoroaster, Zachalias.

BOOK II

LIBER II

I. MUNDUM et hoc—quocumque[1] nomine alio caelum appellare libuit cuius circumflexu teguntur[2] cuncta, numen esse credi par est, aeternum, inmensum, neque genitum neque interiturum umquam. huius extera indagare nec interest hominum nec
2 capit humanae coniectura mentis. sacer est, aeternus, inmensus, totus in toto, immo vero ipse totum, finitus et infinito similis, omnium rerum certus et similis incerto, extra intra cuncta conplexus in se, idemque rerum naturae opus et rerum ipsa natura.

3 Furor est mensuram eius animo quosdam agitasse atque prodere ausos, alios rursus occasione hinc sumpta aut ab[3] his data innumerabiles tradidisse mundos, ut totidem rerum naturas credi oporteret, aut, si una omnes incubaret, totidem tamen soles totidemque lunas et cetera ut iam in uno et inmensa et innumerabilia sidera, quasi non eadem quaestione

[1] *Rackham*: quodcunque *aut* quod *codd.*
[2] *v.l.* degunt ('*go on*').
[3] ab *add. Rackham.*

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[a] The Pythagorean and Stoic creed.
[b] A variant gives 'infinite and resembling the finite.'

BOOK II

The world—its nature.

I. THE world and this—whatever other name men have chosen to designate the sky whose vaulted roof encircles the universe, is fitly believed to be a deity,[a] eternal, immeasurable, a being that never began to exist and never will perish. What is outside it does not concern men to explore and is not within the grasp of the human mind to guess. It is sacred, eternal, immeasurable, wholly within the whole, nay rather itself the whole, finite and resembling the infinite,[b] certain of all things and resembling the uncertain, holding in its embrace all things that are without and within, at once the work of nature and nature herself.

Its size.

That certain persons have studied, and have dared to publish, its dimensions, is mere madness; and again that others,[c] taking or receiving occasion from the former, have taught the existence of a countless number of worlds, involving the belief in as many systems of nature, or, if a single nature embraces all the worlds, nevertheless the same number of suns, moons and other unmeasurable and innumerable heavenly bodies, as already in a single world; just as if owing to our craving for some End the same problem would not always encounter us at

[c] The founders of the atomic theory, Leucippus and Democritus.

semper in termino cogitationis occursura desiderio finis alicuius aut, si haec infinitas naturae omnium artifici possit adsignari, non idem illud in uno facilius
4 sit intellegi, tanto praesertim opere. furor est, profecto furor, egredi ex eo et, tamquam interna eius cuncta plane iam nota sint, ita scrutari extera, quasi vero mensuram ullius rei possit agere qui sui nesciat, aut mens[1] hominis[2] possit[3] videre quae mundus ipse non capiat.

5 II. Formam eius in speciem orbis absoluti globatam esse nomen in primis et consensus in eo mortalium orbem appellantium, sed et argumenta rerum docent, non solum quia talis figura omnibus sui partibus vergit in sese ac sibi ipsa toleranda est seque includit et continet nullarum egens compagium nec finem aut initium ullis sui partibus sentiens, nec quia ad motum, quo subinde[4] verti mox adparebit, talis aptissima est, sed oculorum quoque probatione, quod convexus mediusque quacumque cernatur, cum id accidere in alia non possit figura.

6 III. Hanc ergo formam eius aeterno et inrequieto ambitu, inenarrabili celeritate, viginti quattuor horarum spatio circumagi solis exortus et occasus

[1] mens *edd.*: meror, miror (haut minor *Detlefsen*).
[2] *v.l.* homines.
[3] possit *om. nonnulli.*
[4] sublime *Detlefsen*, rotunde *Mayhoff*.

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[a] Cf. Martial V. 39. 5 Aut semel fac illud | mentitur tua quod subinde tussis.
[b] *Convexus* is used to denote the inside as well as the outside of a curve.

the termination of this process of thought, or as if, assuming it possible to attribute this infinity of nature to the artificer of the universe, that same property would not be easier to understand in a single world, especially one that is so vast a structure. It is madness, downright madness, to go out of that world, and to investigate what lies outside it just as if the whole of what is within it were already clearly known; as though, forsooth, the measure of anything could be taken by him that knows not the measure of himself, or as if the mind of man could see things that the world itself does not contain.

Shape of world.

II. Its shape has the rounded appearance of a perfect sphere. This is shown first of all by the name of 'orb' which is bestowed upon it by the general consent of mankind. It is also shown by the evidence of the facts: not only does such a figure in all its parts converge upon itself; not only must it sustain itself, enclosing and holding itself together without the need of any fastenings, and without experiencing an end or a beginning at any part of itself; not only is that shape the one best fitted for the motion with which, as will shortly appear, it must repeatedly[a] revolve, but our eyesight also confirms this belief, because the firmament presents the aspect of a concave[b] hemisphere equidistant[c] in every direction, which would be impossible in the case of any other figure.

Revolution of world.

III. The world thus shaped then is not at rest but eternally revolves with indescribable velocity, each revolution occupying the space of 24 hours: the rising and setting of the sun have left this not

[c] *Medius* properly denotes the position of the observer at the centre, and is transferred to the circumference observed.

haut dubium reliquere. an sit inmensus et ideo sensum aurium excedens tantae molis rotatae vertigine adsidua sonitus non equidem facile dixerim —non Hercule magis quam circumactorum simul tinnitus siderum suosque volventium orbes—an dulcis quidam et incredibili suavitate concentus. nobis qui intus agimus iuxta diebus noctibusque
7 tacitus labitur mundus. esse innumeras ei effigies animalium rerumque cunctarum inpressas nec, ut in volucrum notamus ovis, levitate continua lubricum corpus, quod clarissimi auctores dixere, rerum argumentis indicatur, quoniam inde deciduis rerum omnium seminibus innumeris,[1] in mari praecipue, ac plerumque confusis monstrificae gignantur effigies, praeterea visus probatione, alibi ursi, tauri alibi, alibi plaustri,[2] alibi litterae figura, candidiore medio per verticem circulo.

8 Equidem et consensu gentium moveor. namque et Graeci [3] nomine ornamenti appellavere eum et nos a perfecta absolutaque elegantia mundum. caelum quidem haut dubie caelati argumento dici-
9 mus,[4] ut interpretatur M. Varro. adiuvat rerum ordo

[1] *Rackham*: innumerae.
[2] alibi plaustri *hic Rackham, ante aut post* alibi ursi *aut om. codd.*
[3] *v.l.* nam quem κόσμον Graeci.
[4] *v.l.* diximus.

[a] Deltoton, the constellation of the Triangle, Greek Δ.
[b] κόσμος.
[c] *Mundus* (adj.) means 'neat,' 'elegant.'

doubtful. Whether the sound of this vast mass whirling in unceasing rotation is of enormous volume and consequently beyond the capacity of our ears to perceive, for my own part I cannot easily say—any more in fact than whether this is true of the tinkling of the stars that travel round with it, revolving in their own orbits; or whether it emits a sweet harmonious music that is beyond belief charming. To us who live within it the world glides silently alike by day and night. Stamped upon it are countless figures of animals and objects of all kinds—it is not the case, as has been stated by very famous authors, that its structure has an even surface of unbroken smoothness, like that which we observe in birds' eggs: this is proved by the evidence of the facts, since from seeds of all these objects, falling from the sky in countless numbers, particularly in the sea, and usually mixed together, monstrous shapes are generated; and also by the testimony of sight—in one place the figure of a bear, in another of a bull, in another a wain, in another a letter of the alphabet,[a] the middle of the circle across the pole being more radiant.

The world's beauty.

For my own part I am also influenced by the agreement of the nations. The Greeks have designated the world by a word that means 'ornament,'[b] and we have given it the name of *mundus*,[c] because of its perfect finish and grace! As for our word *caelum*, it undoubtedly has the signification 'engraved,' as is explained by Marcus Varro.[d] Further assistance is contributed by its orderly

[d] *De Lingua Latina* V 18: engraved (*caelum* 'chisel,' *caedere*) with the figures of the constellations. *Caelum*, 'the vault of the sky,' is really for *cavilum*, from *cavus*.

discripto circulo qui signifer vocatur in duodecim animalium effigies, et per illas solis cursus congruens tot saeculis ratio.

10 IV. Nec de elementis video dubitari quattuor esse ea: igneum summum, inde tot stellarum illos conlucentium oculos; proximum spiritum quem Graeci nostrique eodem vocabulo aera appellant, vitalem hunc et per cuncta rerum meabilem totoque consertum; huius vi suspensam cum quarto aquarum
11 elemento librari medio spatii tellurem. ita mutuo conplexu diversitatis effici nexum, et levia ponderibus inhiberi quo minus evolent, contraque gravia ne ruant suspendi levibus in sublime tendentibus. sic pari in diversa nisu in suo quaeque loco[1] consistere, inrequieto mundi ipsius constricta circuitu, quo semper in se recurrente[2] imam atque mediam in toto esse terram, eandemque universo cardine stare pendentem librantemque per quae pendeat; ita solam inmobilem circa eam volubili universitate eandemque ex omnibus necti eidemque omnia inniti.[3]
12 inter hanc caelumque eodem spiritu pendent certis discreta spatiis septem sidera quae ab incessu vocamus errantia, cum errent nulla minus illis. eorum medius sol fertur amplissima magnitudine ac

[1] loco *add. Rackham* (*sic? Campbell*).
[2] *C. F. W. Müller*: currente.
[3] *v.l.* innecti.

[a] 'Wanderers,' πλανῆται.

structure, the circle called the Zodiac being marked out into the likenesses of twelve animals; and also by the uniform regularity in so many centuries of the sun's progress through these signs.

Four elements.

IV. As regards the elements also I observe that they are accepted as being four in number: topmost the element of fire, source of yonder eyes of all those blazing stars; next the vapour which the Greeks and our own nation call by the same name, air—this is the principle of life, and penetrates all the universe and is intertwined with the whole; suspended by its force in the centre of space is poised the earth, and with it the fourth element, that of the waters. Thus the mutual embrace of the unlike results in an interlacing, the light substances being prevented by the heavy ones from flying up, while on the contrary the heavy substances are held from crashing down by the upward tendency of the light ones. In this way owing to an equal urge in opposite directions the elements remain stationary, each in its own place, bound together by the unresting revolution of the world itself; and with this always running back to its starting-point, the earth is the lowest and central object in the whole, and stays suspended at the pivot of the universe and also balancing the bodies to which its suspension is due; thus being alone motionless with the universe revolving round her she both hangs attached to them all and at the same time is that on which they all rest.

The planets

Upheld by the same vapour between earth and heaven, at definite spaces apart, hang the seven stars which owing to their motion we call 'planets,'[a] although no stars wander less than they do.

The sun.

In the midst of these moves the sun, whose magnitude and power are the greatest,

potestate, nec temporum modo terrarumque sed
13 siderum etiam ipsorum caelique rector. hunc esse mundi totius animum ac planius mentem, hunc principale naturae regimen ac numen credere decet opera eius aestimantes. hic lucem rebus ministrat aufertque tenebras, hic reliqua sidera occultat inlustrat, hic vices temporum annumque semper renascentem ex usu naturae temperat, hic caeli tristitiam discutit atque etiam humani nubila animi serenat, hic suum lumen ceteris quoque sideribus fenerat, praeclarus, eximius, omnia intuens, omnia etiam exaudiens, ut principi litterarum Homero placuisse in uno eo video.

14 V. Quapropter effigiem dei formamque quaerere inbecillitatis humanae reor. quisquis est deus, si modo est aliquis,[1] et quacumque in parte, totus est sensus, totus visus, totus auditus, totus animae, totus animi, totus sui. Innumeros quidem credere atque etiam ex vitiis hominum, non virtutibus tantum,[2] ut Pudicitiam, Concordiam, Mentem, Spem, Honorem, Clementiam, Fidem, aut (ut Democrito placuit) duos omnino, Poenam et Bene-
15 ficium, maiorem ad socordiam accedit. fragilis et laboriosa mortalitas in partes ista digessit infirmitatis suae memor, ut portionibus coleret qui quisque[3] maxime indigeret. itaque nomina[4] alia aliis gentibus et numina in iisdem innumerabilia invenimus, inferis quoque in genera discriptis, morbisque et multis

[1] *Vulg.* alius.
[2] *Mayhoff*: atque etiam ex vitiis hominum *aut* atque tam ex virtutibus vitiisque hominum *codd.*
[3] *Mayhoff*: quidque quo *codd.*
[4] numina? *Rackham.*

[a] A variant gives 'if only he be other (than the world).'
[b] No other authority records this of Democritus.

and who is the ruler not only of the seasons and of the lands, but even of the stars themselves and of the heaven. Taking into account all that he effects, we must believe him to be the soul, or more precisely the mind, of the whole world, the supreme ruling principle and divinity of nature. He furnishes the world with light and removes darkness, he obscures and he illumines the rest of the stars, he regulates in accord with nature's precedent the changes of the seasons and the continuous re-birth of the year, he dissipates the gloom of heaven and even calms the storm-clouds of the mind of man, he lends his light to the rest of the stars also; he is glorious and pre-eminent, all-seeing and even all-hearing—this I observe that Homer the prince of literature held to be true in the case of the sun alone.

The divine Nature inscrutable.

V. For this reason I deem it a mark of human weakness to seek to discover the shape and form of God. Whoever God is—provided there is a God[a]—and in whatever region he is, he consists wholly of sense, sight and hearing, wholly of soul, wholly of mind, wholly of himself. To believe in gods without number, and gods corresponding to men's vices as well as to their virtues, like the Goddesses of Modesty, Concord, Intelligence, Hope, Honour, Mercy and Faith—or else, as Democritus held,[b] only two, Punishment and Reward, reaches an even greater height of folly. Frail, toiling mortality, remembering its own weakness, has divided such deities into groups, so as to worship in sections, each the deity he is most in need of. Consequently different races have different names for the deities,[c] and we find countless deities in the same races, even those of the lower

[c] Or, altering the text, 'have different deities.'

etiam pestibus, dum esse placatas[1] trepido metu
16 cupimus. ideoque etiam publice Febris fanum in Palatio dicatum est, Orbonae ad aedem Larum et ara Malae Fortunae Esquiliis. quamobrem maior caelitum populus etiam quam hominum intellegi potest, cum singuli quoque ex semetipsis totidem deos faciant Iunones Geniosque adoptando sibi, gentes vero quaedam animalia et aliqua etiam obscena pro dis habeant ac multa dictu magis pudenda, per fetidos cibos et alia[2] similia iurantes.
17 matrimonia quidem inter deos credi tantoque aevo ex eis neminem nasci, et alios esse grandaevos semper canosque, alios iuvenes atque pueros, atricolores, aligeros, claudos, ovo editos et alternis diebus viventes morientesque, puerilium prope deliramentorum est; sed super omnem inpudentiam adulteria inter ipsos fingi, mox iurgia et odia, atque
18 etiam furtorum esse et scelerum numina. deus est mortali iuvare mortalem, et haec ad aeternam gloriam via: hac proceres iere Romani, hac nunc caelesti passu cum liberis suis vadit maximus omnis aevi rector Vespasianus Augustus fessis rebus subveniens.
19 hic est vetustissimus referendi bene merentibus gratiam mos, ut tales numinibus adscribant. quippe

[1] *v.l.* placata.
[2] *v.l.* per fetidas cepas, allia et (cf. XIX. 101).

world being classified into groups, and diseases and also many forms of plague, in our nervous anxiety to get them placated. Because of this there is actually a Temple of Fever consecrated by the nation on the Palatine Hill, and one of Bereavement at the Temple of the Household Deities, and an Altar of Misfortune on the Esquiline. For this reason we can infer a larger population of celestials than of human beings, as individuals also make an equal number of gods on their own, by adopting their own private Junos and Genii; while certain nations have animals, even some loathsome ones, for gods, and many things still more disgraceful to tell of—swearing by rotten articles of food and other things of that sort. To believe even in marriages taking place between gods, without anybody all through the long ages of time being born as a result of them, and that some are always old and grey, others youths and boys, and gods with dusky complexions, winged, lame, born from eggs, living and dying on alternate days—this almost ranks with the mad fancies of children; but it passes all bounds of shamelessness to invent acts of adultery taking place between the gods themselves, followed by altercation and enmity, and the existence of deities of theft and of crime. For mortal to aid mortal—this is god; and this is the road to eternal glory: by this road went our Roman chieftains, by this road now proceeds with heavenward step, escorted by his children, the greatest ruler of all time, His Majesty Vespasian, coming to the succour of an exhausted world. To enrol such men among the deities is the most ancient method of paying them gratitude for their benefactions. In fact the names

et aliorum nomina deorum et quae supra retuli
siderum ex hominum nata sunt meritis: Iovem
quidem aut Mercurium aliterve alios inter se vocari
et esse caelestem nomenclaturam quis non inter-
20 pretatione naturae fateatur? inridendum agere
curam rerum humanarum illud quicquid est sum-
mum. anne tam tristi atque multiplici ministerio
non pollui credamus? dubitemusne? vix prope[1]
est iudicare utrum magis conducat generi humano,
quando aliis nullus est deorum respectus, aliis
21 pudendus: externis famulantur sacris, ac digitis
deos gestant; monstra quoque quae colunt damnant,
et excogitant cibos; imperia dira in ipsos se[2] ne
somno quidem quietos[3] inrogant; non matrimonia,
non liberos, non denique quicquam aliud nisi iuben-
tibus sacris deligunt; alii in Capitolio fallunt ac
fulminantem periurant Iovem—et hos iuvant scelera,
illos sacra sua poenis agunt.
22 Invenit tamen inter has utrasque sententias
medium sibi ipsa mortalitas numen, quo minus
etiam plana de deo coniectatio esset: toto quippe
mundo et omnibus locis omnibusque horis omnium
vocibus Fortuna sola invocatur ac nominatur, una ac-
cusatur, rea una agitur, una cogitatur,[4] sola laudatur,
sola arguitur et cum conviciis colitur: volubilis, a
plerisque vero et caeca existimata, vaga, inconstans,

[1] Vix prodest *Mayhoff*, vix profecto *Detlefsen*.
[2] se *add. Rackham*.
[3] *Rackham*: quieto.
[4] [una cogitatur] *Campbell*.

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[a] I.e. engraved on rings.
[b] I.e. whether to rear or to expose the children born to them.

of the other gods, and also of the stars that I have mentioned above, originated from the services of men: at all events who would not admit that it is the interpretation of men's characters that prompts them to call each other Jupiter or Mercury or other names, and that originates the nomenclature of heaven? That that supreme being, whate'er it be, pays heed to man's affairs is a ridiculous notion. Can we believe that it would not be defiled by so gloomy and so multifarious a duty? Can we doubt it? It is scarcely pertinent to determine which is more profitable for the human race, when some men pay no regard to the gods at all and the regard paid by others is of a shameful nature: they serve as the lackeys of foreign ritual, and they carry gods on their fingers[a]; also they pass sentence of punishment upon the monsters they worship, and devise elaborate viands for them; they subject themselves to awful tyrannies, so as to find no repose even in sleep; they do not decide on marriage or having a family[b] or indeed anything else except by the command of sacrifices; others cheat in the very Capitol and swear false oaths by Jupiter who wields the thunder-bolts—and these indeed make a profit out of their crimes, whereas the others are penalized by their religious observances.

Deification of Fortune.

Nevertheless mortality has rendered our guesses about God even more obscure by inventing for itself a deity intermediate between these two conceptions. Everywhere in the whole world at every hour by all men's voices Fortune alone is invoked and named, alone accused, alone impeached, alone pondered, alone applauded, alone rebuked and visited with reproaches; deemed volatile and indeed by most men blind as well, wayward, inconstant, uncertain, fickle in her favours

incerta, varia indignorumque fautrix. huic omnia
expensa, huic omnia feruntur accepta, et in tota
ratione mortalium sola utramque paginam facit;
adeoque obnoxii sumus sorti,[1] ut sors ipsa pro deo
23 sit, qua deus probatur incertus. pars alia et hanc
pellit astroque suo eventus adsignat et nascendi
legibus: semelque in omnes futuros umquam deo
decretum, in reliquom vero otium datum. sedere
coepit sententia haec, pariterque et eruditum vulgus
24 et rude in eam cursu vadit: ecce fulgurum monitus,
oraculorum praescita, haruspicum praedicta, atque
etiam parva dictu in auguriis, sternumenta et
offensiones pedum. divus Augustus prodidit laevum
sibi calceum praepostere inductum quo die seditione
25 militari prope adflictus est. quae singula inprovidam
mortalitatem involvont, solum ut inter ista vel
certum sit nihil esse certi nec quicquam miserius
homine aut superbius: ceteris quippe animantium
sola victus cura est, in quo sponte naturae benignitas
sufficit, uno quidem vel praeferendo cunctis bonis,
quod de gloria, de pecunia, de[2] ambitione, superque
de morte non cogitant.

26 Verum in his deos agere curam rerum humanarum
credi ex usu vitae est, poenasque maleficiis aliquando
seras, occupato deo in tanta mole, numquam autem

[1] *Edd.*: obnoxiae sumus sortis.
[2] de *add. Rackham.*

and favouring the unworthy. To her is debited all that is spent and credited all that is received, she alone fills both pages in the whole of mortals' account; and we are so much at the mercy of chance that Chance herself, by whom God is proved uncertain, takes the place of God. Another set of people banishes fortune also, and attributes events to its star and to the laws of birth, holding that for all men that ever are to be God's decree has been enacted once for all, while for the rest of time leisure has been vouchsafed to Him. This belief begins to take root, and the learned and unlearned mob alike go marching on towards it at the double: witness the warnings drawn from lightning, the forecasts made by oracles, the prophecies of augurs, and even inconsiderable trifles—a sneeze, a stumble—counted as omens. His late Majesty put abroad a story that on the day on which he was almost overthrown by a mutiny in the army he had put his left boot on the wrong foot. This series of instances entangles unforeseeing mortality, so that among these things but one thing is in the least certain—that nothing certain exists, and that nothing is more pitiable, or more presumptuous, than man! inasmuch as with the rest of living creatures their sole anxiety is for the means of life, in which nature's bounty of itself suffices, the one blessing indeed that is actually preferable to every other being the fact that they do not think about glory, money, ambition, and above all death.

The powers of deity.

But it agrees with life's experience to believe that in these matters the gods exercise an interest in human affairs; and that punishment for wickedness, though sometimes tardy, as God is occupied in so vast a mass of things, yet is never frustrated; and

inritas esse, nec ideo proximum illi genitum hominem
27 ut vilitate iuxta beluas esset. inperfectae vero in homine naturae praecipua solatia, ne deum quidem posse omnia,—namque nec sibi potest mortem consciscere, si velit, quod homini dedit optimum in tantis vitae poenis, nec mortales aeternitate donare aut revocare defunctos, nec facere ut qui vixit non vixerit, qui honores gessit non gesserit,—nullumque habere in praeterita ius praeterquam oblivionis, atque (ut facetis quoque argumentis societas haec cum deo copuletur) ut bis dena viginti non sint aut multa similiter efficere non posse: per quae declaratur haut dubie naturae potentia, idque esse quod deum vocemus. in haec divertisse non fuerit alienum, volgata iam [1] propter adsiduam quaestionem de deo.

28 VI. Hinc redeamus ad reliqua naturae. sidera, quae adfixa diximus mundo, non ita [2] ut existimat volgus, singulis attributa nobis et clara divitibus, minora pauperibus, obscura defectis ac pro sorte cuiusque lucentia adnumerata mortalibus, nec cum

[1] *Detlefsen*: volgatam (*v.l.* propter volgatam assidue).
[2] ita *Detlefsen*: illa.

that man was not born God's next of kin for the purpose of approximating to the beasts in vileness. But the chief consolations for nature's imperfection in the case of man are that not even for God are all things possible—for he cannot, even if he wishes, commit suicide, the supreme boon that he has bestowed on man among all the penalties of life, nor bestow eternity on mortals or recall the deceased, nor cause a man that has lived not to have lived or one that has held high office not to have held it—and that he has no power over what is past save to forget it, and (to link our fellowship with God by means of frivolous arguments as well) that he cannot cause twice ten not to be twenty [a] or do many things on similar lines: which facts unquestionably demonstrate the power of nature, and prove that it is this that we mean by the word 'God.' It will not have been irrelevant to have diverged to these topics, which have already been widely disseminated because of the unceasing enquiry into the nature of God.

VI. Let us return from these questions to the remaining facts of nature. We have stated [b] that the stars are attached to the firmament, not assigned to each of us in the way in which the vulgar believe, and dealt out to mortals with a degree of radiance proportionate to the lot of each, the brightest stars *Astrology discarded.* to the rich, the smaller ones to the poor, the dim to those who are worn out; they do not each rise with their own human being, nor indicate by

[a] Cf. A. E. Housman *Last Poems* XXXV:

—To think that two and two are four
And neither five nor three,
The heart of man has long been sore
And long 'tis like to be.

[b] Above, §§ 7–9.

suo quaeque homine oriuntur[1] nec aliquem exstingui
29 decidua significant. non tanta caelo societas nobis-
cum est ut nostro fato mortalis sit ibi quoque
siderum fulgor. illa nimio alimento tracti umoris
ignea vi abundantiam reddunt cum decidere cre-
duntur, ut apud nos quoque luminibus accensis
30 liquore olei notamus accidere. ceterum aeterna
caelestibus est natura intertexentibus mundum
intextoque concretis, potentia autem ad terram
magnopere eorum pertinens, quae propter effectus
claritatemque et magnitudinem in tanta subtilitate
nosci potuerunt, sicut suo demonstrabimus loco.
circulorum quoque caeli ratio in terrae mentione
aptius dicetur, quando ad eam tota pertinet, signiferi
31 modo inventionibus[2] non dilatis. obliquitatem eius
intellexisse, hoc est rerum fores aperuisse, Anaxi-
mander Milesius traditur primus Olympiade quin-
quagesima octava, signa deinde in eo Cleostratus,
et prima arietis ac sagittarii, sphaeram ipsam ante
multo Atlas.

Nunc relicto mundi ipsius corpore reliqua inter
32 caelum terrasque tractentur. summum esse quod
vocant Saturni sidus ideoque minimum videri et
maximo ambire circulo ac tricesimo anno cum
brevissime ad[3] sedis suae principia regredi certum
est; omnium autem errantium siderum meatus,

[1] *Detlefsen*: orta oriuntur *aut* orta moriuntur.
[2] inventoribus *Sabell.*
[3] *v.l.* ad brevissima *codd. fere omnes.*

[a] XVIII 210 ff. [b] VI 211 ff.
[c] 548–545 B.C.

their fall that someone's life is being extinguished. There is no such close alliance between us and the sky that the radiance of the stars there also shares our fate of mortality. *Astronomy.* When the stars are believed to fall, what happens is that owing to their being overfed with a draught of liquid they give back the surplus with a fiery flash, just as with us also we see this occur with a stream of oil when lamps are lit. But the heavenly bodies have a nature that is eternal—they interweave the world and are blended with its weft; yet their potency has a powerful influence on the earth, indeed it is owing to the effects that they produce and to their brilliance and magnitude that it has been possible for them to become known with such a degree of precision, as we shall show in the proper place.[a] Also the system of the revolutions of the sky will be more appropriately stated when we deal with geography,[b] since it is entirely related to the earth; only we must not postpone the discoveries that have been made as to the zodiac. Tradition says that Anaximander of Miletus in the fifty-eighth Olympiad[c] was the first person to discover the obliquity of the zodiac, that is, to open the portals of science; and that next Cleostratus explained the signs in it, beginning with the Ram and the Archer; the firmament itself having been explained long before by Atlas.

The planets. Let us now leave the frame of the world itself and treat the remaining bodies situated between the sky and the earth. The following points are certain: (1) The star called Saturn's is the highest and consequently looks the smallest and revolves in the largest orbit, returning in thirty years at the shortest to its initial station. (2) The motions of all the planets,

interque ea solis et lunae, contrarium mundo agere cursum, id est laevom, illo semper in dextram praeci-
33 piti: et quamvis adsidua conversione inmensae celeritatis attollantur ab eo rapianturque in occasum, adverso tamen ire motu per suos quaeque passus; ita fieri ne convolutus aer eandem in partem aeterna mundi vertigine ignavo globo torpeat sed fundatur adverso siderum verbere discretus et digestus;
34 Saturni autem sidus gelidae ac rigentis esse naturae, multumque ex eo inferiorem Iovis circulum et ideo motu celeriore duodenis circumagi annis; tertium Martis, quod quidam Herculis vocant, igne ardens solis vicinitate, binis fere annis converti, ideoque huius ardore nimio et rigore Saturni interiectum ambobus ex utroque temperari Iovem salutaremque fieri;
35 dein solis meatum esse partium quidem trecentarum sexaginta, sed ut observatio umbrarum eius redeat ad metas,[1] quinos annis dies adici superque quartam partem diei; quam ob causam quinto cuique [2] anno unus intercalarius dies additur ut temporum ratio solis itineri congruat.

36 Infra solem ambit ingens sidus appellatum Veneris, alterno meatu vagum ipsisque cognominibus aemulum solis ac lunae: praeveniens quippe [3] et ante matutinum exoriens Luciferi nomen accipit ut sol alter diemque maturans, contra ab occasu refulgens nuncupatur Vesper ut prorogans lucem vicemque

[1] *Detlefsen* (metam? *Rackham*): notas *aut* motus.
[2] cuique *add. Rackham* (quoque *Harduin*).
[3] quippe solem? *Rackham.*

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[a] In Roman arithmetic, for example, 1938 would be called the fifth year after 1934.

and among them the sun and moon, follow a course contrary to that of the world, namely to the left, the world always running to the right. (3) Although they are borne on by it and carried westward with an unceasing revolution of immeasurable velocity, nevertheless they travel with an opposite motion along their respective tracks. (4) Thus it comes about that the air is not massed in a dull lethargic ball by revolving in the same direction because of the eternal rotation of the world, but is scattered into separate portions by the opposite impact of the stars. (5) Saturn is of a cold and frozen nature. The orbit of Jupiter is much below it and therefore revolves much faster, completing one rotation every twelve years. The third star is Mars, called by some Hercules; owing to the proximity of the sun it has a fiery glow; it revolves once in about two years, and consequently, owing to its excessive heat and Saturn's frost, Jupiter being situated between them combines the influence of each and is rendered healthy. (6) Next, the sun's course is divided into 360 parts, but in order that an observation taken of the shadows that it casts may come round to the starting-point, five and a quarter days *per annum* are added; consequently to every fourth [a] year an intercalary day is added to make our chronology tally with the course of the sun.

Below the sun revolves a very large star named Venus, which varies its course alternately, and whose alternative names in themselves indicate its rivalry with the sun and moon—when in advance and rising before dawn it receives the name of Lucifer, as being another sun and bringing the dawn, whereas when it shines after sunset it is named Vesper, as prolonging

37 lunae reddens. quam naturam eius Pythagoras Samius primus deprehendit Olympiade circiter XLII, qui fuit urbis Romae annus CXLII. iam magnitudine extra cuncta alia sidera est, claritatis quidem tantae ut unius huius stellae radiis umbrae reddantur. itaque et in magno nominum ambitu est: alii enim Iunonis, alii Isidis, alii Matris Deum
38 appellavere. huius natura cuncta generantur in terris; namque in alterutro exortu genitali rore conspergens non terrae modo conceptus inplet, verum animantium quoque omnium stimulat. signiferi autem ambitum peragit trecenis et duodequinquagenis diebus, a sole numquam absistens partibus sex atque quadraginta longius, ut Timaeo
39 placet. simili ratione, sed nequaquam magnitudine aut vi, proximum illi Mercurii sidus, a quibusdam appellatum Apollinis, inferiore circulo fertur novem diebus ociore ambitu, modo ante solis exortum modo post occasum splendens, numquam ab eo XXII[1] partibus remotior, ut Cidenas et Sosigenes docent. ideo et peculiaris horum siderum ratio est neque
40 communis cum supra dictis; nam ea et quarta parte caeli a sole abesse et tertia, et adversa soli saepe cernuntur, maioresque alios habent cuncta plenae conversionis ambitus in magni anni ratione dicendos.
41 Sed omnium admirationem vincit novissimum sidus, terris familiarissimum et in tenebrarum

[1] XXIII *Hermolaus Barbarus.*

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[a] 612–609 B.C.
[b] 753 B.C.
[c] *magnum annum . . . quitum efficitur cum solis et lunae et quinque errantium ad eandem inter se comparationem confectis omnium spatiis est facta conversio*, Cic. *N.D.* II. 51. The

the daylight, or as being a deputy for the moon. This property of Venus was first discovered by Pythagoras of Samos about the 42nd Olympiad,[a] 142 years after the foundation[b] of Rome. Further it surpasses all the other stars in magnitude, and is so brilliant that alone among stars it casts a shadow by its rays. Consequently there is a great competition to give it a name, some having called it Juno, others Isis, others the Mother of the Gods. Its influence is the cause of the birth of all things upon earth; at both of its risings it scatters a genital dew with which it not only fills the conceptive organs of the earth but also stimulates those of all animals. It completes the circuit of the zodiac every 348 days, and according to Timaeus is never more than 46 degrees distant from the sun. The star next to Venus is Mercury, by some called Apollo; it has a similar orbit, but is by no means similar in magnitude or power. It travels in a lower circle, with a revolution nine days quicker, shining sometimes before sunrise and sometimes after sunset, but according to Cidenas and Sosigenes never more than 22 degrees away from the sun. Consequently the course of these stars also is peculiar, and not shared by those above-mentioned: those are often observed to be a quarter or a third of the heaven away from the sun and travelling against the sun, and they all have other larger circuits of full revolution, the specification of which belongs to the theory of the Great Year.[c]

But the wonder of everyone is vanquished by the last star, the one most familiar to the earth, and *The eart*

theory of the Cosmic Year is attributed to the Pythagoreans and to Heraclitus; Plato, *Timaeus* 39, gives its length as 10,000 years.

remedium ab natura repertum, lunae. multiformi haec ambage torsit ingenia contemplantium et proximum ignorari maxime sidus indignantium, cres-
42 cens semper aut senescens, et modo curvata in cornua falcis,[1] modo aequa portione divisa, modo sinuata in orbem, maculosa eademque subito praenitens, inmensa orbe pleno ac repente nulla, alias pernox alias sera et parte diei solis lucem adiuvans, deficiens
43 et in defectu tamen conspicua, quae mensis exitu latet cum laborare non creditur; iam vero humilis, iam [2] excelsa, et ne id quidem uno modo, sed alias admota caelo alias contigua montibus, nunc in aquilonem elata nunc in austros deiecta. quae singula in ea deprehendit hominum primus Endymion; ob id amor [3] eius [4] fama traditur. non sumus profecto grati erga eos qui labore curaque lucem nobis aperuere in hac luce, miraque humani ingeni peste sanguinem et caedes condere annalibus iuvat, ut scelera hominum noscantur mundi ipsius ignaris.

44 Proxima ergo cardini ideoque minimo ambitu, vicenis diebus septenisque et tertia diei parte peragit spatia eadem quae Saturni sidus altissimum triginta, ut dictum est, annis. dein morata in coitu solis biduo, cum tardissime, a tricesima luce rursus ad

[1] *Jan*: facie.
[2] iam *add. Rackham*: *v.l.* et excelsa.
[3] *Mayhoff*: amore.
[4] *v.l.* eius captus.

[a] An eclipse of sun or moon was often called *labor*: Virgil, *Aen.* I. 742, *Georg.* II. 478.

devised by nature to serve as a remedy for the shadows of darkness—the moon. By the riddle of her transformations she has racked the wits of observers, who are ashamed that the star which is nearest should be the one about which we know least—always waxing or waning, and now curved into the horns of a sickle, now just halved in size, now rounded into a circle; spotted and then suddenly shining clear; vast and full-orbed, and then all of a sudden not there at all; at one time shining all night and at another rising late and for a part of the day augmenting the light of the sun, eclipsed *Eclipses* and nevertheless visible during the eclipse, invisible at the end of the month when she is not believed to be in trouble [a]; again at one time low down and at another up aloft, and not even this in a uniform way, but sometimes raised to the sky and sometimes touching the mountain-tops, now borne up to the North and now carried down to the South. The first human being to observe all these facts about her was Endymion—which accounts for the traditional story of his love for her. We forsooth feel no gratitude towards those whose assiduous toil has given us illumination on the subject of this luminary, while owing to a curious disease of the human mind we are pleased to enshrine in history records of bloodshed and slaughter, so that persons ignorant of the facts of the world may be acquainted with the crimes of mankind.

The moon then is nearest to the pole, and there- *The moon.* fore has the smallest orbit, completing the same distance every $27\frac{1}{3}$ days that Saturn the highest star covers, as we have said, in 30 years. Then she lingers two days in conjunction with the sun, and after the

easdem vices exit, haut scio an omnium quae in caelo
pernosci potuerunt magistra: in duodecim mensium
45 spatia oportere dividi annum, quando ipsa totiens
solem redeuntem ad principia consequitur; solis
fulgore eam ut reliqua siderum regi, siquidem in
totum mutuata ab eo luce fulgere, qualem in reper-
cussu aquae volitare conspicimus; ideo molliore et
inperfecta vi solvere tantum umorem, atque etiam
augere, quem solis radii absumant; ideo et inaequali
lumine adspici quia ex adverso demum plena reliquis
diebus tantum ex se terris ostendat quantum ex
46 sole ipsa concipiat; in coitu quidem non cerni,
quoniam haustum omnem lucis adversa illo regerat
unde acceperit; sidera vero haut dubie humore
terreno pasci, quia dimidio orbe nonnumquam
maculosa cernatur, scilicet nondum suppetente ad
hauriendum ultra iusta vi—maculas enim non aliud
esse quam terrae raptas cum humore sordes; de-
fectus autem suos et solis, rem in tota contemplatione
naturae maxime miram et ostento similem, magni-
47 tudinum umbraeque indices exsistere. VII. quippe
manifestum est solem interventu lunae occultari lun-
amque terrae obiectu, ac vices reddi, eosdem solis

[a] This is proved of the moon in the words that follow, and thence assumed to apply also to the other heavenly bodies.

30th day at latest sets out again on the same course—being perhaps our teacher as to all the facts that it has been possible to observe in the heavens; (1) that the year is to be divided into twelve monthly spaces, because she herself that number of times follows the sun in his return to his starting point; (2) that she is governed by the sun's radiance as are the rest of the stars, as in fact she shines with a light entirely borrowed from him, like the light which we see flickering reflected in water; (3) that consequently she only causes water to evaporate with a rather gentle and imperfect force, and indeed increases its quantity, whereas the sun's rays dry it up; (4) also that the reason why she is seen to vary in her light is that she is full only when opposite to the sun, and on the remaining days shows as much light from herself to the earth as she herself conceives from the sun; though (5) she is indeed invisible when in conjunction with the sun, because being turned towards him she gives back the entire draught of light to the source from which she receives it; (6) but that the stars are undoubtedly nourished by the moisture of the earth,[a] since she is sometimes seen spotted in half her orb, clearly because she has not yet got sufficient strength to go on drinking—her spots being merely dirt from the earth taken up with the moisture; (7) but that her eclipses and *Eclipse* those of the sun, the most marvellous and indeed portentous occurrence in the whole of our observation of nature, serve as indications of their dimensions and shadow. VII. It is in fact obvious that the sun is hidden by the passage across it of the moon, and the moon by the interposition of the earth, and that they retaliate on one another, the same rays of

radios luna interpositu suo auferente terrae terraque lunae: hac subeunte repentinas obduci terrae[1] tenebras rursumque illius umbra sidus hebetari, neque aliud esse noctem quam terrae umbram, figuram autem umbrae similem metae ac turbini inverso, quando mucrone tantum ingruat neque lunae excedat altitudinem, quoniam nullum aliud sidus eodem modo obscuretur et talis figura semper in mucronem deficiat: spatio quidem consumi umbras indicio sunt volucrum
48 praealti volatus. ergo confinium illis est aeris terminus initiumque aetheris; supra lunam pura omnia ac diuturnae lucis plena, a nobis autem per noctem cernuntur sidera ut reliqua lumina in tenebris. et propter has causas nocturno tempore deficit luna; stati autem atque menstrui non sunt utrique defectus, propter obliquitatem signiferi lunaeque multivagos, ut dictum est,[2] flexus, non semper in scripulis partium congruente siderum motu.

49 VIII. Haec ratio mortales animos subducit in caelum, ac velut inde contemplantibus trium maximarum rerum naturae partium magnitudinem detegit; non posset quippe totus sol adimi terris intercedente luna si terra maior esset quam luna. certior[3] ex utraque vastitas solis aperietur,[4] ut non

[1] terrae *add.* (?) *Mayhoff.*
[2] [ut dictum est] *edd. vet.*
[3] *Beda*: tertia *codd.*
[4] aperietur (*viz.* § 51 f.): *v.l.* aperitur.

[a] I.e. by the intervention of the earth.
[b] In § 51 f. A variant gives 'the sun's magnitude is shown as third in the series, starting from the two others.'

the sun being taken away from the earth by the moon intervening and from the moon by the earth: at the transit of the former a sudden shadow passes over the earth, and in return the shadow of the latter dims the heavenly body (the moon), and the darkness is merely the earth's shadow, but the shape of the shadow is conical, resembling a spinning-top upside down, as it impinges only with its point and does not go beyond the altitude of the moon, because no other star is obscured in the same way,[a] and a conical figure always tapers off into a point: that shadows are made to disappear by distance is proved when birds fly to extreme heights. Consequently the frontier between the moon and the other heavenly bodies is at the point where the air ends and the aether begins. All the space above the moon is clear and filled with continual light, but to us the stars are visible through the night in the same way as other lights in shadows. And these are the reasons why the moon wanes in the night-time; but both of her wanings are irregular and not monthly, because of the slant of the zodiac and the widely varying curves of the moon's course, as has been stated, the motion of the heavenly bodies not always tallying in minute fractional quantities.

VIII. This theory leads mortal minds upward to *The sun.* heaven, and discloses to their observation from that height, as it were, the greatness of the three greatest parts of the universe; clearly it would not be possible for the whole of the sun to be eclipsed from the earth by the passage of the moon between them if the earth were larger than the moon. The vast size of the sun will be shown[b] with the more certainty from the two bodies, so that there is no need to investigate

sit necesse amplitudinem eius oculorum argumentis
50 atque coniectura animi scrutari: immensum esse, quia arborum in limitibus porrectarum in quotlibet passuum milia umbras paribus iaciat intervallis tamquam toto spatio medius, et quia per aequinoctium omnibus in meridiana plaga habitantibus simul fiat a vertice, item quia circa solstitialem circulum habitantium meridie ad septentrionem umbrae cadant, ortu vero ad occasum, quae fieri nullo modo possent nisi multo quam terra maior esset, et quod montem Idam exoriens latitudine exsuperet, dextra laevaque large amplectens, praesertim tanto discretus intervallo.

51 Defectus lunae magnitudinem eius haut dubia ratione declarat, sicut terrae parvitatem ipse deficiens. namque cum sint tres umbrarum figurae, constetque, si par lumini sit materia quae iaciat, umbram columnae [1] effigie iaci nec habere finem, si vero maior materia quam lumen, turbinis recti, ut sit imum eius angustissimum et simili modo infinita longitudo, si minor materia quam lux, metae existere effigiem in cacuminis finem desinentem, talemque cerni umbram deficiente luna, palam fit, ut nulla amplius relinquatur dubitatio solem superare
52 magnitudinem terrae. id quidem et tacitis naturae ipsius indiciis: cur enim partitis vicibus anni brumalis

[1] cylindri? *Rackham.*

[a] I.e. central at every point in the space alike.

its size by the evidence of the eyes and by logical inference, arguing that it is immeasurably large for the following reasons: (1) the shadow that it throws of rows of trees along the balks of fields are at equal distances apart for ever so many miles, just as if over the whole space the sun were in the centre;[a] (2) during the equinoxes it reaches the vertical simultaneously for all the inhabitants of the southern region; (3) the shadows of the people living round the Tropic of Cancer fall northward at midday but westward at sunrise, which could not happen unless the sun were much larger than the earth; (4) when it is rising its breadth exceeds Mount Ida, overlapping it widely right and left—and that though it is separated from it by so great a distance.

The eclipse of the moon supplies indubitable proof of the size of the sun, just as the sun itself when it suffers eclipse proves the smallness of the earth. For shadows are of three shapes, and it is clear that, if the solid object that throws a shadow is equal in area to the shaft of light, the shadow projected is shaped like a pillar and is of infinite length, but if the solid body is larger than the light, the shadow has the shape of an upright spinning-top, so that it is narrowest at the bottom, and infinite in length as in the former case, while if the solid is smaller than the light the result is the figure of a cone narrowing down to end in a point, and this is the nature of the shadow observed during an eclipse of the moon; hence it is proved without any further possibility of doubt remaining that the sun exceeds the earth's size. Indeed, this is also proved by the silent testimony of nature herself; for why in the division of the turns of the year does the winter sun

abscedit ut noctium opacitate terras reficiat?[1] exusturus haut dubie, et sic quoque exurens quadam in parte, tanta magnitudo est.

53 IX. Et rationem quidem defectus utriusque primus Romani generis in vulgum extulit Sulpicius Gallus (qui consul cum M. Marcello fuit, sed tum tribunus militum), sollicitudine exercitu liberato pridie quam Perseus rex superatus a Paulo est in concionem ab imperatore productus ad praedicendam eclipsim; mox et conposito volumine. apud Graecos autem investigavit primus omnium Thales Milesius Olumpiadis XLVIII anno quarto praedicto solis defectu qui Alyatte rege factus est urbis conditae anno CLXX. post eos utriusque sideris cursum in sexcentos annos praececinit Hipparchus, menses gentium diesque et horas ac situs locorum et visus populorum conplexus, aevo teste haut alio modo

54 quam consiliorum naturae particeps. viri ingentes, supraque mortalium naturam, tantorum numinum lege deprehensa et misera hominum mente metu soluta,[2] in defectibus siderum scelera aut mortem aliquam pavente (quo in metu fuisse Stesichori et Pindari vatum sublimia ora palam est deliquio solis) aut in lunae veneficia arguente mortalitate et ob id crepitu dissono auxiliante (quo pavore ignarus causae Nicias Atheniensium imperator veritus classem portu

[1] reficiat ⟨aliter⟩? *Rackham*.
[2] *Rackham*: mente insoluta, mente absoluta.

[a] At Pydna, 168 B.C.
[b] Perhaps *situs* denotes latitude and *visus* longitude.
[c] Or possibly 'as time has shown.'
[d] Pindar, fr. 74 (Bergk[2]). The passage of Stesichorus is not extant.

retire, so as to refresh the earth with the darkness of the nights? when otherwise it would unquestionably scorch up the earth, and even as it is does so in a certain part, so great is its magnitude.

Eclipses, theories as t

IX. The first person indeed of Roman nationality who published an explanation of both kinds of eclipse was Sulpicius Gallus—the colleague in the consulship of Marcus Marcellus, but at the time military tribune—who delivered the army from fear when on the day before the defeat[a] of King Perseus by Paulus he was brought before an assembly by the commander-in-chief to foretell an eclipse; and later also by writing a treatise. The original discovery was made in Greece by Thales of Miletus, who in the fourth year of the 48th Olympiad (585 B.C.) foretold the eclipse of the sun that occurred in the reign of Alyattes, in the 170th year after the foundation of Rome. After their time the courses of both stars for 600 years were prophecied by Hipparchus, whose work embraced the calendar of the nations and the situations of places and aspects of the peoples[b]—his method being, on the evidence of his contemporaries,[c] none other than full partnership in the designs of nature. O mighty heroes, of loftier than mortal estate, who have discovered the law of those great divinities and released the miserable mind of man from fear, mortality dreading as it did in eclipses of the stars crimes or death of some sort (those sublime singers, the bards Stesichorus and Pindar,[d] clearly felt this fear owing to an eclipse of the sun), or in the dying of the moon inferring that she was poisoned and consequently coming to her aid with a noisy clattering of cymbals (this alarm caused the Athenian general Nicias, in his ignorance of the cause, to be afraid to

educere opes eorum adflixit): macti ingenio este, caeli interpretes rerumque naturae capaces, argumenti repertores quo deos hominesque vicistis!
55 quis enim haec cernens et statos siderum (quoniam ita appellare placuit) labores non suae necessitati mortales genitos ignoscat?

Nunc confessa de iisdem breviter atque capitulatim attingam ratione admodum necessariis locis strictimque reddita, nam neque instituti operis talis argumentatio est, neque omnium rerum afferri posse causas minus mirum est quam constare in aliquis.

56 X. Defectus CCXXIII mensibus redire in suos orbis certum est, solis defectus non nisi novissima primave fieri luna, quod vocant coitum, lunae autem non nisi plena, semperque citra quam proxime fuerint; omnibus autem annis fieri utriusque sideris defectus statis diebus horisque sub terra, nec tamen, cum superne fiant, ubique cerni, aliquando propter nubila, saepius globo terrae obstante convexitatibus
57 mundi. intra ducentos annos Hipparchi sagacitate conpertum est et lunae defectum aliquando quinto mense a priore fieri, solis vero septimo, eundem bis

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[a] Eclipse of the moon, 27 Aug., 413 B.C., caused Nicias to delay abandoning the siege of Syracuse: Plutarch, *Nicias*, 23.

[b] Cf. § 43 *n.*

[c] It is tempting to rewrite this passage—*deos hominesque vinxistis*! (so one MS.) *quis enim . . . non sua necessitate* (Rackham) *mortales genitos* (v. l.) *agnoscat* (Dalec.)? '—a theory

lead his fleet out of harbour, so destroying the Athenians' resources [a]): all hail to your genius, ye that interpret the heavens and grasp the facts of nature, discoverers of a theory whereby you have vanquished gods and men! for who beholding these truths and the regularity of the stars' periods of trouble [b] (for so it has pleased you to call them), would not forgive his own destiny for the generation of mortals? [c]

Now I will briefly and summarily touch on facts that are admitted about the same matters, giving an account of them only at necessary points and in a cursory manner, because such theorizing does not form part of the task that I have set in hand, and also it is less surprising that explanations cannot be produced for all the facts than that agreement has been reached on some of them.

Eclipses cyclic.

X. It is certain that eclipses recur in cycles of 223 months—eclipses of the sun only when the moon is in her last or first phase (this is called their 'conjunction'), eclipses of the moon only at full moon—and always within the period of their last occurrence; but that yearly at fixed days and hours eclipses of either star occur below the earth, and that even when they occur above the earth they are not visible everywhere, sometimes owing to clouds, more often because the earth's globe stands in the way of the world's curvature. Less than 200 years ago the penetration of Hipparchus discovered that an eclipse of the moon also sometimes occurs four months after the one before and an eclipse of the sun six

whereby ye have fettered gods and men! for who would not recognise that mortals are born with a fixed destiny of their own?'

in triginta diebus super terras occultari, sed ab aliis atque aliis[1] hoc cerni, quaeque sunt in hoc miraculo maxime mira, cum conveniat umbra terrae lunam hebetari, nunc ab occasus parte hoc ei accidere, nunc ab exortus, et quanam ratione, cum solis exortu umbra illa hebetatrix sub terra esse debeat, semel iam acciderit ut in occasu luna deficeret utroque super terram conspicuo sidere. nam ut XV diebus utrumque sidus quaereretur et nostro aevo accidit imperatoribus Vespasianis patre III. filio iterum consulibus.

58 XI. Lunam semper aversis a sole cornibus, si crescat, ortus spectare, si minuatur, occasus, haut dubium est, et[2] lucere dodrantes semuncias horarum ab secunda adicientem usque ad plenum orbem detrahentemque in deminutionem, intra quattuordecim autem partes solis semper occultam esse. quo argumento amplior errantium stellarum quam lunae magnitudo colligitur, quando illae et a septenis interdum partibus emergant; sed altitudo cogit minores videri, sicut adfixas caelo solis fulgor interdiu non cerni, cum aeque ac noctu luceant, idque manifestum fiat defectu solis et praealtis puteis.

59 XII. Errantium autem tres quas supra solem diximus sitas occultantur meantes cum eo, exoriuntur

[1] *v.l. om.* atque aliis.
[2] et *add. Rackham.*

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[a] I.e. one eclipse to the inhabitants of the northern hemisphere, the other to those of the southern.
[b] A.D. 71.

months, and that the latter when above earth is hidden twice in thirty days, but that this eclipse is visible to different nations,[a] and—the most remarkable features of this remarkable occurrence—that when it comes about that the moon is obscured by the shadow of the earth, this sometimes happens to it from the west side and sometimes from the east; and he also discovered for what exact reason, although the shadow causing the eclipse must from sunrise onward be below the earth, it happened once in the past that the moon was eclipsed in the west while both luminaries were visible above the earth. For the eclipse of both sun and moon within 15 days of each other has occurred even in our time, in the year of the third consulship of the elder Emperor Vespasian and the second consulship of the younger.[b]

The moon's phases.

XI. It is unquestionable that the moon's horns are always turned away from the sun, and that when waxing she faces east and when waning west; and that the moon shines $47\frac{1}{2}$ minutes longer[c] daily from the day after new moon to full and $47\frac{1}{2}$ minutes less daily to her wane, while within 14 degrees of the sun she is always invisible. This fact proves that the planets are of greater magnitude than the moon, since these occasionally become visible even on reaching 7 degrees' distance; but their altitude makes them appear smaller, just as the sun's radiance makes the fixed stars invisible in daytime, although they are shining as much as in the night, which becomes manifest at a solar eclipse and also when the star is reflected in a very deep well.

The planets, their motions and occultation

XII. The three planets whose positions we have stated to be above the sun travel with the sun when

[c] I.e. rises $47\frac{1}{2}$ minutes earlier.

vero a[1] matutino discedentes partibus numquam amplius undenis. postea a[2] radiorum eius contactu regrediuntur,[3] et in triquetro a partibus centum viginti stationes matutinas faciunt, quae et primae vocantur, mox in[4] adverso a partibus centum octoginta exortus vespertinos, iterumque in centum viginti ab alio latere appropinquantes stationes vespertinas quas et secundas vocant, donec assecutus sol in partibus duodenis occultet illas, qui vespertini
60 occasus appellantur. Martis stella ut propior etiam ex quadrato sentit radios, a nonaginta partibus, unde et nomen accepit motus primus et secundus nonagenarius dictus ab utroque exortu. eadem stationalis senis mensibus conmoratur in signis, alioqui bimestris, cum ceterae utraque statione quaternos
61 menses non inpleant. inferiores autem duae occultantur in coitu vespertino simili modo, relictaeque a sole totidem in partibus faciunt exortus matutinos, atque a longissimis distantiae suae metis solem insecuntur, adeptaeque occasu matutino conduntur ac praetereunt. mox eodem intervallo vespere exoriuntur usque ad quos diximus terminos. ab his retrogradiuntur ad solem et occasu vespertino delitescunt. Veneris stella et stationes duas, matutinam vespertinamque, ab utroque exortu facit a

[1] a *add. Rackham.*
[2] a *add. Rackham.*
[3] *Brotier*: reguntur *aut* teguntur.
[4] in *v.l. om*: ex ? *Rackham.*

they set and are never more than 11 degrees separate from the sun at dawn when they rise. Afterwards they retire from contact with his rays, and make their morning or 'first' stations in a triangle 120 degrees away, and subsequently their evening risings opposite 180 degrees away, and again approaching from the other side, make their evening or 'second' stations 120 degrees away, till the sun overtaking them at 12 degrees obscures them—this is called their evening setting. The planet Mars being nearer feels the sun's rays even from its quadrature, at an angle of 90 degrees, which has given to his motion after each rising the name of 'first' or 'second ninety-degree.' At the same time Mars remains stationary in the signs of the zodiac for periods of six months (otherwise having a two-month period), whereas Jupiter and Saturn spend less than four months in each station.[a] The two lower planets (Mercury and Venus) are similarly obscured at their evening conjunction, and when left by the sun make their morning rising the same number of degrees away, and from the further limits of their distance follow the sun and when they have overtaken him are hidden in their morning setting and pass away. Then they rise in the evening at the same distance apart, as far as the limits we have stated. From these they pass backward to the sun, and disappear in their evening setting. The planet Venus actually makes two stations, morning and evening, after each rise, from the furthest

[a] Brotier: Martis stella proprio cursu bimestris est, hoc est duobus mensibus signum unum pervagatur, binis ferme annis duodena (cf. 34). Eadem ab una statione ad alteram menses senos insumit: ceterae, Jovis et Saturni, vix quaternos.

longissimis distantiae suae finibus. Mercurii stationes breviore momento quam ut deprehendi possint.

62 XIII. Haec est luminum occultationumque ratio, perplexior motu multisque involuta miraculis, siquidem magnitudines suas et colores mutant, et eaedem ad septentrionem accedunt abeuntque ad austrum, terrisque propiores aut caelo repente cernuntur. in quibus aliter multa quam priores tradituri fatemur ea quoque illorum esse muneris qui primi quaerendi vias demonstraverint, modo ne quis desperet saecula proficere semper.

63 Pluribus de causis haec omnia accidunt. prima circulorum quos Graeci ἀψίδας in stellis vocant (etenim Graecis utendum erit vocabulis). sunt autem hi suus [1] cuique earum, aliique quam mundo, quoniam terra a verticibus duobus quos appellaverunt polos centrum caeli est, nec non et signiferi oblique inter eos siti. [omnia autem haec constant ratione circini semper indubitata.] [2] ergo ab alio cuique centro apsides suae exsurgunt, ideoque diversos habent orbes motusque dissimiles, quoniam interiores apsidas necesse est breviores esse.

64 Igitur a terrae centro apsides altissimae sunt Saturno in scorpione, Iovi in virgine, Marti in leone, soli in geminis, Veneri in sagittario, Mercurio in

[1] *Rackham*: sui. [2] *Secl. edd.*

[a] Editors reject this as an interpolation.

limits of her distance. Mercury's stations have too short a period to be perceptible.

XIII. This is the system of the shining and occultation of the planets: it is more complicated from their motion and involves many remarkable facts, inasmuch as they change their magnitude and their colours, and both approach the North and retire towards the South, and suddenly are seen closer to the earth or to the sky. And although our account of these matters will differ in many points from that of our predecessors, we confess that credit for these points also must be given to those who first demonstrated the methods of investigating them: only nobody must abandon the hope that the generations are constantly making progress.

due to three causes.

All these occurrences are due to a plurality of causes. The first is the factor of the circles which in the case of the stars the Greeks designate *apsides* or arcs (it will be necessary to employ Greek terms). Each planet has its own circle, and these are not the same as those of the firmament, since the earth between the two vertices, named in Greek *poles*, is the centre of the sky, and also of the zodiac, which is situated on a slant between the poles. [All these facts are always established beyond doubt by the method of compasses.[a]] Therefore the special arc of each is drawn from a different centre, and consequently they have different orbits and dissimilar motions, because the inner arcs must necessarily be shorter.

It follows that the points of the arcs highest above the centre of the earth are: in the case of Saturn in Scorpio, in that of Jupiter in Virgo, of Mars in Leo, of the sun in the Twins, of Venus in the Archer,

capricorno, lunae in tauro,[1] mediis omnium partibus, et e contrario humillimae atque ad terrae centrum[2] proximae. sic fit ut tardius moveri et minores videantur cum altissimo ambitu feruntur, cum vero terrae appropinquaverint maiores esse et celerius ferri, non quia adcelerent tardentve naturales motus, qui certi ac singuli sunt illis, sed quia deductas ab summa apside lineas coarctari ad centrum necesse est sicut in rotis radios, idemque motus alias maior alias minor centri propinquitate sentitur.

65 Altera sublimitatium causa quoniam a suo centro apsidas altissimas habent in aliis signis, Saturnus in librae parte vicesima, Iuppiter cancri quinta decuma, Mars capricorni XXVIII, sol arietis XXIX, Venus piscium XXVII, Mercurius virginis XV, luna tauri IV.

Tertia altitudinum ratio caeli mensura, non circuli, intellegitur, subire eas aut descendere per profundum aeris oculis aestimantibus.

66 Huic conexa latitudinum signiferi obliquitatisque causa est. per hunc stellae quas diximus feruntur, nec aliud habitatur in terris quam quod illi subiacet, reliqua a polis squalent. Veneris tantum stella excedit eum binis partibus, quae causa intellegitur efficere ut quaedam animalia et in desertis mundi nascantur. luna quoque per totam latitudinem eius

[1] *Detlefsen e Beda.*
[2] *Rackham*: ad terrae centrum *ante* humillimae.

[a] The planets, § 30 fin.

of Mercury in Capricorn, of the moon in the Bull, at the middle of each, and the points lowest and nearest to the centre of the earth are opposite. The result of this is that they appear to move slower and to be smaller when they are travelling at the highest point of their circuit, but to be larger and travel faster when they have come nearer to the earth, not because they actually accelerate or reduce their natural motions, which are fixed and individual to them, but because lines drawn from the top of the arc to the centre necessarily converge like the spokes of a wheel, and the same motion at one time is perceived as faster and at another slower according to its distance from the centre.

Another reason of their elevations is because they have the points of their arcs highest from their centre in different signs—Saturn in the 20th degree of the Scales, Jupiter in the 15th of the Crab, Mars in the 28th of Capricorn, the sun in the 29th of the Ram, Venus in the 27th of the Fishes, Mercury in the 15th of Virgo, the moon in the 4th of the Bull.

A third explanation of their altitudes is explained by the dimensions of the firmament, not that of a circle, the eye judging them to rise or to sink through the depth of the air.

Orbits of the planets (1) relation to the zodiac;

Linked with this is the cause of the latitudes of the zodiac and of its obliquity. The stars we have mentioned[a] travel through the zodiac, and the only habitable part of the earth is what lies beneath it—all the other parts towards the poles are frost-bound. Only the planet Venus goes two degrees outside the zodiac; this is understood to be the reason that causes some animals to be born even in the desert places of the world. The moon also wanders through

vagatur, sed omnino non excedens eum. ab his
Mercuri stella laxissime, ut tamen e duodenis
partibus (tot enim sunt latitudinis) non amplius
octonas pererret, neque has aequaliter, sed duas
67 medio eius et supra quattuor infra duas. sol deinde
medio fertur inter duas partes flexuoso draconum
meatu inaequalis, Martis stella quattuor mediis,
Iovis media et super eam duabus, Saturni duabus
ut sol. haec erit latitudinum ratio ad austrum
descendentium aut ad aquilonem subeuntium. hac
constare et tertiam illam a terra subeuntium in
caelum, et pariter scandi eam quoque existimavere
plerique falso. qui ut coarguantur, aperienda est
subtilitas inmensa et omnes eas conplexa causas.

68 Convenit stellas in occasu vespertino proximas
esse terrae et altitudine et latitudine, exortusque
matutinos in initio cuiusque fieri, stationes in mediis
latitudinum articulis, quae vocant ecliptica. perinde
confessum est motum augeri quamdiu in vicino sint
terrae, cum abscedant in altitudinem, minui; quae
ratio lunae maxime sublimitatibus adprobatur.
aeque non est dubium in exortibus matutinis etiam-
num augere atque a stationibus primis tres superiores
69 diminuere usque ad stationes secundas. quae cum
ita sint, manifestum erit ab exortu matutino lati-

[a] § 65 fin.
[b] *Prima ratio*, § 63.
[c] *Secunda ratio*, § 65.
[d] *Tertia ratio*, § 65 fin.
[e] See § 71 fin.

the whole of its breadth, but without going at all outside it. The planet Mercury diverges very widely from these, but without wandering over more than 8 of the 12 degrees of latitude of the zodiac, and these 8 not uniformly but two in the middle of the zodiac, four above it and two below it. Then the sun travels unevenly in the middle of the zodiac between the two halves with a wavy serpentine course, the planet Mars over 4 degrees in the middle, Jupiter one in the middle and two above it, Saturn two like the sun. This will be the principle of the latitudes of the planets when setting towards the South or rising towards the North. Most people have supposed that with this system agrees also the third mentioned above,[a] that of their rising from the earth to the sky, and that this ascent also is made simultaneously; but this is a mistake. To refute them it is necessary to develop an extremely abstruse argument that embraces all the causes mentioned.

(2) in relation to the earth.

It is agreed[b] that the planets are nearest to the earth in both altitude and latitude at their evening setting, and that their morning risings occur at the beginning of both altitude and latitude, while their stations occur in the middle sections of the altitudes, called 'ecliptics.' It is similarly admitted[c] that their velocity increases as long as they are in the neighbourhood of the earth and decreases when they withdraw from it to a height: this theory is specially supported by the apogees of the moon. It is equally undoubted[d] that the three higher ones[e] moreover increase their motion in their morning risings and diminish it from their first (morning) stations to their second (evening) stations. In view of these facts it will be evident that the latitudes are ascended from

tudines scandi quoniam in eo primum habitu incipiat parcius adici motus, in stationibus vero primis et altitudinem subiri, quoniam tum primum incipiant detrahi numeri [1] stellaeque retroire. cuius rei ratio privatim reddenda est. percussae in qua diximus parte et triangulo solis radio inhibentur rectum
70 agere cursum, et ignea vi levantur in sublime. hoc non protinus intellegi potest visu nostro, ideoque existimantur stare, unde et nomen accepit statio. progreditur deinde eiusdem radii violentia et retroire cogit vapore percussas. multo id magis in vespertino earum exortu, toto sole adverso [2] cum in summas apsidas expelluntur, minimaeque cernuntur quoniam altissime absunt et minimo feruntur motu, tanto minore [3] cum hoc in altissimis apsidum evenit signis.
71 ab exortu vespertino latitudo descenditur parcius iam se minuente motu, non tamen ante stationes secundas augente, cum et altitudo descenditur, superveniente ab alio latere radio eademque vi rursus ad terras deprimente qua sustulerat in caelum e priore triquetro. tantum interest subeant radii an superveniant, multoque eadem magis in vespertino occasu accidunt.

Haec est superiorum stellarum ratio; difficilior reliquarum et a nullo ante nos reddita.

[1] *v.l.* incipiat . . . numerus.
[2] *v.l.* auerso.
[3] *v.l.* minores.

their morning rising, because in that state their acceleration first begins to diminish, but in their first stations their altitude also is ascended, since then the numbers first begin to be reduced and the stars begin to recede. The reason for this must especially be given. When struck in the degree that we stated and by a triangular ray of the sun they are prevented from pursuing a straight course, and are lifted upward by the fiery force. This cannot be directly perceived by our sight, and therefore they are thought to be stationary, which has given rise to the term ‘station.’ Then the violent force of the same ray advances and compels them by the impact of the heat to retire. This occurs much more at their evening rising, when they are driven out to the top of their apsides by the full opposing force of the sun, and appear very small because they are at the distance of their greatest altitude and are moving with their smallest velocity—which is proportionately smaller when this occurs in the highest signs of their apsides. From their evening rise their altitude is descended with a velocity now decelerating less and less, but not accelerating before their second stations, when their altitude also is descended, the ray passing above them from the other side and pressing them down again to the earth with the same force as that with which it had raised them to the sky from the former triangle. So much difference does it make whether the rays come from below or from above, and the same things occur far more in the evening setting.

This is the theory of the higher stars; that of the rest is more difficult and has been explained by nobody before ourselves.

72 XIV. Primum igitur dicatur, cur Veneris stella numquam longius XLVI partibus, Mercurii XXIII ab sole abscedant, saepe citra eas ad solem reciprocent. conversas habent utraeque apsidas ut infra solem sitae, tantumque circuli earum sub terra est quantum superne praedictarum; et ideo non possunt abesse amplius quoniam curvatura apsidum ibi non habet longitudinem maiorem: ergo utrique simili ratione modum statuunt apsidum suarum margines, ac spatia longitudinis latitudinum evaga-
73 tione pensant. at enim cur non semper ad quadraginta sex et ad partes viginti tres perveniunt? immo vero; sed ratio canonicos fallit. namque apparet apsidas quoque earum moveri, quod numquam transeant solem; itaque cum in partem ipsam eius incidere margines alterutro latere, tum et stellae ad longissima sua intervalla pervenisse[1] intelleguntur: cum citra fuere margines, totidem partibus et ipsae ocius redire coguntur, cum sit illa semper utrique extremitas summa.

74 Hinc et ratio motuum conversa intellegitur. superiores enim celerrime feruntur in occasu vespertino, hae tardissime, illae a terra altissime absunt cum tardissime moventur, hae cum ocissime, quia

[1] *Rackham*: pervenire.

Orbits of Venus and Mercury.

XIV. First therefore let us state the reason why Venus never departs more than 46 degrees and Mercury never more than 23 degrees from the sun, and why they often retire and return towards the sun within those limits. As situated below the sun both have arcs that are the opposite of those of the other planets, and as much of their circle is below the earth as that of the planets mentioned before is above it; and they cannot be further from it than they are because the curve of their arcs does not allow greater elongation there; consequently the edges of their arcs put a limit on a similar principle for each, and compensate for the dimensions of their longitude by the enlargement of their latitude. But, it will be objected, why do they not reach 46 and 23 degrees always? As a matter of fact they do, but the explanation escapes the theorists. For it is manifest that even their arcs alter, because they never cross the sun; accordingly when the edges have fallen on one side or the other into the actual degree of the sun, then the stars also are understood to have reached their longest distances, but when the edges are short of that, they themselves too are compelled to return with proportionately greater velocity, since with each of them that is always the extreme limit.

This also explains the contrary principle of their motions. For the higher planets travel most quickly in their evening setting, whereas these travel most slowly, and the former are farthest from the earth when their pace is slowest but the latter are highest when their pace is quickest—the reason being that with the latter the circumference of the circle accelerates their pace in the same manner as

sicut in illis propinquitas centri adcelerat ita in his extremitas circuli, illae ab exortu matutino minuere celeritatem incipiunt, hae vero augere. illae retro cursum agunt a statione matutina usque ad vespertinam, Veneris a vespertina usque ad matutinam.
75 incipit autem ab exortu matutino latitudinem scandere, altitudinem vero subire[1] ac solem insequi a statione matutina, ocissima in occasu matutino et altissima, degredi autem latitudine motumque minuere ab exortu vespertino, retro quidem ire simulque altitudine degredi a statione vespertina; Mercurii rursus stella utroque modo scandere ab exortu matutino, degredi vero latitudine a vespertino, consecutoque sole ad quindecim partium intervallum
76 consistit quatriduo prope immobilis. mox ab altitudine descendit retroque graditur ab occasu vespertino usque ad exortum matutinum. tantumque haec et luna totidem diebus quot subiere descendunt; Veneris quindecies pluribus subit, rursus Saturni et Iovis duplicato degrediuntur, Martis etiam quadruplicato. tanta est naturae varietas; sed ratio evidens: nam quae in vaporem solis nituntur etiam descendunt aegre.
77 XV. Multa promi amplius circa haec possunt secreta naturae legesque quibus ipsa serviat, exempli gratia in Martis sidere (cuius est maxime inobservabilis cursus) numquam id stationem facere Iovis sidere triquetro, raro admodum sexaginta partibus discreto (qui numerus sexangulas mundi efficit

[1] subire *add. Urlichs.*

proximity to the centre does in the case of the former; the former begin to decelerate from their morning setting, but the latter to accelerate. The former travel backward from their morning to their evening station, the planet Venus from her evening to her morning station. But she begins to climb her latitude after her morning rise, but after her morning station to ascend her altitude and follow the sun, being swiftest and highest at her morning setting; whereas she begins to descend in latitude and decelerate after her evening rising, and to turn back and simultaneously to descend in altitude after her evening station; on the other hand the planet Mercury begins to climb in both ways after his morning rising, but after his evening rising to descend in latitude, and following the sun at an interval of 15 degrees he stands motionless for almost four days. Afterwards he descends from his altitude and proceeds back from his evening setting to his morning rise. And only this planet and the moon set in as many days as they have risen in; Venus ascends in 15 times as many days as she sets in, while Saturn and Jupiter descend in twice as many, and Mars in actually four times as many. So great is the variety of nature; but the reason is evident—bodies that strain up into the heat of the sun also have difficulty in descending.

Other relations of particular planets to the zodiac.

XV. Many more facts can be produced about these mysteries of nature and the laws that she obeys—for example, in the case of the planet Mars (whose course it is very difficult to observe) that it never makes its station with Jupiter at an angle of 120°, and very seldom with Jupiter separated 60° (which amounts to $\frac{1}{6}$th of the celestial

formas,[1]) nec exortus nisi in duobus signis tantum, cancri et leonis, simul edere, Mercuri vero sidus exortus vespertinos in piscibus raros facere, creberrimos in virgine, in libra matutinos, item matutinos in aquario, rarissimos in leone, retrogradum in tauro et in geminis non fieri, in cancro vero non citra vice-
78 simam quintam partem, lunam bis coitum cum sole in nullo alio signo facere quam geminis, non coire aliquando in sagittario tantum, novissimam vero primamque eadem die vel nocte nullo alio in signo quam ariete conspici (id quoque paucis mortalium contigit, et inde fama cernendi Lynceo), non conparere in caelo Saturni sidus et Martis cum plurimum diebus centum septuaginta, Iovis triginta sex, aut cum minimum denis detractis diebus omnia, Veneris sexaginta novem aut cum minimum quinquaginta duobus, Mercuri tredecim aut cum plurumum septemdecim.

79 XVI. Colores ratio altitudinum temperat, siquidem earum similitudinem trahunt in quarum aera venere subeundo, tinguitque adpropinquantes utralibet alieni meatus circulus, frigidior in pallorem, ardentior in ruborem, ventosus in livorem,[2] sol atque commissurae apsidum, extremaeque orbitae, atram in obscuritatem. suus quidem cuique color est, Saturno candidus, Iovi clarus, Marti igneus, Lucifero candens, Vesperi refulgens, Mercurio radians, lunae blandus, soli cum oritur ardens, post

[1] [qui . . . formas]? *Rackham.*
[2] *Mayhoff*: horrorem *aut* honorem.

[a] Literally ' which number produces the hexagonal shapes of the world '—apparently meaning that to draw in a circle 6 radii at angles of 60° and join the points where they reach the circumference produces a regular hexagon. Even if we

sphere [a]), and never makes its rises simultaneously with Jupiter except in two signs only, Cancer and Leo, whereas the planet Mercury rarely makes its evening rises in Pisces, and most frequently in Virgo, its morning rises in Libra, and also its morning rises in Aquarius, very rarely in Leo; it does not make its return in Taurus and in Gemini, and not below the 25th degree in Cancer; Gemini is the only sign in which the moon makes conjunction with the sun twice, Sagittarius the only one in which she does not meet him at all, Aries the only one in which the old moon and the new moon are visible on the same day or night (and this too it has happened to few mortals to see, hence Lynceus's reputation for keen sight); the longest period of invisibility for the planets Saturn and Mars is 170 days, for Jupiter 36 days; the shortest periods for all these are 10 days less; Venus's period is 69 days or at shortest 52, Mercury's 13 or at longest 17.

Colours of the planets.

XVI. The colours of the planets vary with their altitudes, inasmuch as they are assimilated to the stars into whose atmosphere they come in rising, and the circuit of another's path modifies their colour in either direction as they approach, a colder circuit to pallor, a hotter one to redness, a windy one to a leaden colour, the sun and the intersection of its orbit with theirs, and also the extremities of their paths, changing them to black darkness. It is true that each has its own special hue—Saturn white, Jupiter transparent, Mars fiery, Lucifer bright white, Vesper glaring, Mercury radiant, the moon soft, the sun when rising glowing and

emend *sexangulas formas* to the singular, this clumsily expressed piece of geometry looks like an interpolation.

radians, his causis conexo visu et earum[1] quae caelo
80 continentur. namque modo multitudo conferta inest circa dimidios orbes lunae, placida nocte leniter inlustrante eas, modo raritas, ut fugisse miremur, plenilunio abscondente aut cum solis suprave dictarum radii visus praestrinxere nostros. et ipsa autem luna ingruentium solis radiorum haut dubie differentias sentit, hebetante cetero inflexos mundi convexitate eos praeterquam ubi recti angulorum conpetant ictus. itaque in quadrato solis dividua est, in triquetro seminani ambitur orbe, inpletur autem in adverso, rursusque minuens easdem effigies paribus edit intervallis, simili ratione qua super solem tria sidera.

81 XVII. Sol autem ipse quattuor differentias habet, bis aequata nocte diei, vere et autumno, in centrum incidens terrae octavis in partibus arietis ac librae, bis permutatis spatiis, in auctum diei bruma octava in parte capricorni, noctis vero solstitio totidem in partibus cancri. inaequalitatis causa obliquitas signiferi cum pars aequa mundi super subterque terras omnibus fiat momentis; sed quae recta in exortu suo consurgunt signa longiore tractu tenent lucem, quae vero obliqua ociore transeunt spatio.

82 XVIII. Latet plerosque magna caeli adsectatione conpertum a principibus doctrinae viris superiorum

[1] visu ceterarum *Brotier.*

afterwards radiant; with these being causally connected also the appearance of the fixed stars. For at one time there is a dense crowd of stars in the sky round the circle of the half-moon, a fine night giving them a gentle radiance, but at another time they are scarce, so that we wonder at their flight, when the full moon hides them or when the rays of the sun or the planets above-mentioned dim our sight. But the moon herself also is undoubtedly sensitive to the variations of the strength of impact of the rays of the sun, as moreover the curve of the earth dulls their impact, except when the impact of the rays meets at a right angle. And so the moon is at half in the sun's quadrature, and curved in a hollow circle in its trinal aspect, but waxes to full at the sun's opposition, and then waning exhibits the same configurations at corresponding intervals, on the same principle as the three planets above the sun.

The sun's differences

XVII. The sun itself has four differences, as there are two equinoxes, in spring and autumn, when it coincides with the centre of the earth at the eighth degree of Aries and Libra, and two changes of its course, in the eighth degree of Capricorn at midwinter when the days begin to lengthen and in the same degree of Cancer at the summer solstice. The variation is due to the slant of the zodiac, as at every moment an equal part of the firmament is above and below the earth; but the planets that follow a straight path at their rising keep their light for a longer tract and those that follow a slanting path pass in a swifter period.

Thunderbolts from three planets.

XVIII. Most men are not acquainted with a truth known to the founders[a] of the science from their

[a] The Etruscans, c. lii.

trium siderum ignes esse qui decidui ad terras fulminum nomen habeant, sed maxime Iovis[1] medio loco siti, fortassis quoniam contagium nimii umoris ex superiore circulo atque ardoris ex subiecto per hunc modum egerat, ideoque dictum Iovem fulmina iaculari. ergo ut e flagrante ligno carbo cum crepitu, sic a sidere caelestis ignis exspuitur praescita secum adferens, ne abdicata quidem sui parte in divinis cessante operibus. idque maxime turbato fit aeres quia collectus umor abundantiam stimulat aut quia turbatur quodam ceu gravidi sideris partu.

83 XIX. Intervalla quoque siderum a terra multi indagare temptarunt, et solem abesse a luna undeviginti partes quantam lunam ipsam a terra prodiderunt. Pythagoras vero, vir sagacis animi, a terra ad lunam CXXVI milia stadiorum esse collegit, ad solem ab ea duplum, inde ad duodecim signa triplicatum, in qua sententia et Gallus Sulpicius fuit noster.

84 XX. Sed Pythagoras interdum ex musica ratione appellat tonum quantum absit a terra luna, ab ea ad Mercurium dimidium eius spatii, et ab eo ad Venerem tantundem, a qua ad solem sescuplum, a sole ad Martem tonum, id est quantum ad lunam a terra,[2]

[1] *Mayhoff*: *codd.* is, his, extis.
[2] [id est . . . terra] ? *Mayhoff*.

[a] A stade roughly equals a furlong.

arduous study of the heavens, that what when they fall to earth are termed thunderbolts are the fires of the three upper planets, particularly those of Jupiter, which is in the middle position—possibly because it voids in this way the charge of excessive moisture from the upper circle (of Saturn) and of excessive heat from the circle below (of Mars); and that this is the origin of the myth that thunderbolts are the javelins hurled by Jupiter. Consequently heavenly fire is spit forth by the planet as crackling charcoal flies from a burning log, bringing prophecies with it, as even the part of himself that he discards does not cease to function in its divine tasks. And this is accompanied by a very great disturbance of the air, because moisture collected causes an overflow, or because it is disturbed by the birth-pangs so to speak of the planet in travail.

Distances of the planets.

XIX. Many people have also tried to discover the distances of the planets from the earth, and have given out that the distance of the sun from the moon is 19 times that of the moon itself from the earth. The penetrating genius of Pythagoras, however, inferred that the distance of the moon from the earth was 15,750 miles,[a] and that of the sun from the moon twice that figure, and of the sun from the twelve signs of the Zodiac three times. Our fellow-countryman Sulpicius Gallus also held this view.

Their harmonic ratio.

XX. But occasionally Pythagoras draws on the theory of music, and designates the distance between the earth and the moon as a whole tone, that between the moon and Mercury a semitone, between Mercury and Venus the same, between her and the sun a tone and a half, between the sun and Mars a tone (the same as the distance between the earth and the

ab eo ad Iovem dimidium, et ab eo ad Saturnum dimidium, et inde sescuplum ad signiferum; ita septem tonis effici quam diapason harmoniam vocant, hoc est universitatem concentus; in ea Saturnum Dorio moveri phthongo, Iovem Phrygio, et in reliquis similia, iucunda magis quam necessaria subtilitate.

85 XXI. Stadium centum viginti quinque nostros efficit passus, hoc est pedes sexcentos viginti quinque. Posidonius non minus quadraginta stadiorum a terra altitudinem esse in quam nubila ac venti nubesque perveniant, inde purum liquidumque et inperturbatae lucis aera, sed a turbido ad lunam viciens centum milia stadiorum, inde ad solem quinquiens miliens, eo spatio fieri ut tam inmensa eius magnitudo non exurat terras. plures autem nubes nongentis in altitudinem subire prodiderunt. inconperta haec et inextricabilia, sed prodenda quia sunt prodita, in quis tamen una ratio geometricae collectionis numquam fallacis possit non repudiari, si cui libeat altius ista persequi, nec ut mensura (id enim velle paene dementis otii est) sed ut tantum aestumatio
86 coniectandi constet animo. nam cum trecentis sexaginta et fere sex partibus circulum per quem meat orbis solis ex circuitu eius patere appareat, semperque dimetiens tertiam partem ambitus et tertiae paulo minus septimam colligat, apparet, dempta eius

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[a] Ἁρμονία διὰ πασῶν τῶν χορδῶν (all the notes in the scale played successively, not a harmony in the modern sense.)

[b] See p. 296 note.

moon), between Mars and Jupiter half a tone, between Jupiter and Saturn half a tone, between Saturn and the zodiac a tone and a half: the seven tones thus producing the so-called diapason,[a] *i.e.* a universal harmony; in this Saturn moves in the Dorian mode, Jupiter in the Phrygian, and similarly with the other planets—a refinement more entertaining than convincing.

Height of t clouds.

XXI. A stade is equivalent to 125 Roman paces,[b] that is 625 feet. Posidonius holds that mists and winds and clouds reach to a height of not less than 5 miles from the earth, but that from that point the air is clear and liquid and perfectly luminous, but that the distance between the cloudy air and the moon is 250,000 miles and between the moon and the sun 625,000 miles, it being due to this distance that the sun's vast magnitude does not burn up the earth. The majority of writers, however, have stated that the clouds rise to a height of 111 miles. These figures are really unascertained and impossible to disentangle, but it is proper to put them forward because they have been put forward already, although they are matters in which the method of geometrical inference, which never misleads, is the only method that it is possible not to reject, were anybody desirous of pursuing such questions more deeply, and with the intention of establishing not precise measurement (for to aspire to that would mark an almost insane absorption in study) but merely a conjectural calculation. For since it appears from the sun's revolution that the circle through which its orb travels extends nearly 366 degrees, and since the diameter of a circle always measures a little less than $\frac{1}{3} + \frac{1}{21}$ of the circumference, it appears that, as

Distance o sun, moon and sky.

dimidia quoniam terra centralis interveniat, sextam fere partem huius inmensi spatii quod circa terram circuli solaris animo conprehenditur inesse altitudinis spatio, lunae vero duodecimam, quoniam tanto breviore quam sol ambitu currit; ita fieri eam in
87 medio solis ac terrae. mirum quo precedat inprobitas cordis humani parvolo aliquo invitata successu, sicut in supra dictis occasionem inpudentiae ratio largitur. ausique divinare solis ad terram spatia eadem ad caelum agunt, quoniam sit medius sol, ut protinus mundi quoque ipsius mensura veniat ad digitos. quantas enim dimetiens habeat septimas, tantas habere circulum duo et vicesimas, tamquam plane a perpendiculo mensura caeli constet.
88 Aegyptia ratio, quam Petosiris et Nechepsos ostendere, singulas partes in lunari circulo (ut dictum est) minimo triginta tribus stadiis paulo amplius patere colligit, in Saturni amplissimo duplum, in solis, quem medium esse diximus, utriusque mensurae dimidium. quae computatio plurimum habet pudoris, quoniam ad Saturni circulum addito signiferi ipsius intervallo nec numerabilis multiplicatio efficitur.
89 XXII. Restant pauca de mundo. namque et in ipso caelo stellae repente nascuntur. plura earum genera. cometas Graeci vocant, nostri crinitas

half the circle is subtracted by the interposition of the earth at the centre, the measure of the sun's altitude comprises about $\frac{1}{6}$th of this conjecturally estimated immense space of the solar circle round the earth, and the moon's altitude $\frac{1}{12}$th, since the moon runs in a circuit that is much shorter than the sun's; so that it comes between the sun and the earth. It is marvellous to what length the depravity of man's intellect will go when lured on by some trifling success, in the way in which reason furnishes impudence with its opportunity in the case of the calculations above stated. And when they have dared to guess the distances of the sun from the earth they apply the same figures to the sky, on the ground that the sun is at its centre, with the consequence that they have at their finger's ends the dimensions of the world also. For they argue that the circumference of a circle is $\frac{22}{7}$ times its diameter, as though the measure of the heavens were merely regulated from a plumb-line! The Egyptian calculation published by Petosiris and Nechepsos infers that one degree of the lunar circle measures (as has been said) just over $4\frac{1}{8}$ miles at the least, one degree of the widest circle, Saturn's, twice that size, and one of the sun's circle, which we stated to be in the middle, the mean between the other two. This computation is a most shameful business, since the addition of the distance of the zodiac itself to the circle of Saturn produces a multiple that is even beyond reckoning.

XXII. A few facts about the world remain. *Comets. varieties of.* There are also stars that suddenly come to birth in the heaven itself; of these there are several kinds. The Greeks call them 'comets,' in our language 'long-haired stars,' because they have a blood-red

horrentis crine sanguineo et comarum modo in vertice hispidas. iidem pogonias quibus inferiore ex parte in speciem barbae longae promittitur iuba. acontiae iaculi modo vibrantur, atrocissimo significatu; haec fuit de qua quinto consulatu suo Titus Imperator Caesar praeclaro carmine perscripsit, ad hunc diem novissime visa. easdem breviores et in mucronem fastigatas xiphias vocavere, quae sunt omnium pallidissimae et quodam gladii nitore ac sine ullis radiis, quos et disceus, specie [1] nomini similis, colore autem
90 electro, raros e margine emittit. pitheus doliorum cernitur figura in concavo fumidae lucis. ceratias cornus speciem habet, qualis fuit cum Graecia apud Salamina depugnavit. lampadias ardentes imitatur faces, hippeus equinas iubas celerrimi motus atque in orbem circa se euntes. fit et candidus [2] cometes argenteo crine ita refulgens ut vix contueri liceat, specieque humanae faciei [3] effigiem in se ostendens. fiunt et hirci [4] villorum specie et nube aliqua circumdati. semel adhuc iubae effigies mutata in hastam est, Olympiade CVIII,[5] urbis anno CCCCVIII.[6]

[1] specie *add. Detlefsen.*
[2] candidus ⟨Διός⟩ *Mayhoff, cf. Lydus*, p. 163.
[3] *Mayhoff*: humana diei *aut* dei.
[4] *v.l.* hirti. [5] *v.ll.* CIX, CV.
[6] *Edd.*: CCCXCVIII.

[a] The title seems to have become an hereditary surname. Titus's 5th consulship was in A.D. 76, his colleague being Vespasian in his 7th consulship.
[b] Perhaps to be emended 'a shining comet called Zeus's Comet.'

shock of what looks like shaggy hair at their top. The Greeks also give the name of 'bearded stars' to those from whose lower part spreads a mane resembling a long beard. 'Javelin-stars' quiver like a dart; these are a very terrible portent. To this class belongs the comet about which Titus Imperator [a] Caesar in his 5th consulship wrote an account in his famous poem, that being its latest appearance down to the present day. The same stars when shorter and sloping to a point have been called 'Daggers'; these are the palest of all in colour, and have a gleam like the flash of a sword, and no rays, which even the Quoit-star, which resembles its name in appearance but is in colour like amber, emits in scattered form from its edge. The 'Tub-star' presents the shape of a cask, with a smoky light all round it. The 'Horned star' has the shape of a horn, like the one that appeared when Greece fought the decisive battle of Salamis. The 'Torch-star' resembles glowing torches, the 'Horse-star' horses' manes in very rapid motion and revolving in a circle. There also occurs a shining comet [b] whose silvery tresses glow so brightly that it is scarcely possible to look at it, and which displays within it a shape in the likeness of a man's countenance. There also occur 'Goat comets,' enringed with a sort of cloud resembling tufts of hair. Once hitherto it has happened that a 'Mane-shaped' comet [c] changed into a spear; this was in the 108th [d] Olympiad, A.U.C. 408.[e] The shortest period of

[c] Apparently the same as hippeus, the Horse-star, above.
[d] 348–345 B.C. Variant readings give 109th (346–341 B.C.) and 105th (360–357 B.C.).
[e] 346 B.C.—an emendation; the MSS. give A.U.C. 398 (356 B.C.).

brevissimum quo cernerentur spatium VII dierum adnotatum est, longissimum LXXX.[1]

91 XXIII. Moventur autem aliae errantium modo, aliae inmobiles haerent, omnes ferme sub ipso septentrione, aliqua eius parte non certa, sed maxime in candida quae lactei circuli nomen accepit. Aristoteles tradit et simul plures cerni, nemini conpertum alteri, quod equidem sciam, ventos autem ab his graves aestusve significari. fiunt et hibernis mensibus et in austrino polo, sed ibi citra ullum iubar. diraque conperta Aethiopum et Aegypti populis, cui nomen aevi eius rex dedit Typhon, ignea specie ac spirae modo intorta, visu quoque torvo, nec stella
92 verius quam quidam igneus nodus. sparguntur aliquando et errantibus stellis ceterisque crines. sed cometes nonnumquam [2] in occasura parte caeli est, terrificum magna ex parte sidus atque non leviter piatum, ut civili motu Octavio consule iterumque Pompei et Caesaris bello, in nostro vero aevo circa veneficium quo Claudius Caesar imperium reliquit Domitio Neroni, ac deinde principatu eius adsiduum prope ac saevum. referre arbitrantur in quas partes sese iaculetur aut cuius stellae vires accipiat quasque similitudines reddat et quibus in

[1] *Edd.*: CLXXX. [2] *Rackham*: nunquam.

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[a] Editors alter to 180, cf. Seneca *N.Q.* 7. 6. 1 etc.

[b] *Meteorologica*, 345a 29.

[c] The MSS. give 'never': Brotier quotes Aristotle *Meteorol.* 343b 14 ἅπαντες οἱ καθ' ἡμᾶς ὡμμένοι ἄνευ δύσεως ἠφανίσθησαν ἐν τῷ ὑπὲρ τοῦ ὁρίζοντος τόπῳ. But Pliny is not speaking of the *disappearance* of comets. If the MS. reading is accepted, *terrificum* begins a fresh sentence, and refers to comets in all quarters.

visibility on record for a comet is 7 days, the longest 80.[a]

XXIII. Some comets move, like the planets, but others are fixed and stationary, almost all of them towards the due North, not in any particular part of it, though chiefly in the luminous region called the Milky Way. Aristotle also records [b] that several may be seen at the same time—a fact not observed by anyone else, as far as I am aware—and that this signifies severe winds or heat. Comets also occur in the winter months and at the south pole, but comets in the south have no rays. A terrible comet was seen by the people of Ethiopia and Egypt, to which Typhon the king of that period gave his name; it had a fiery appearance and was twisted like a coil, and it was very grim to behold: it was not really a star so much as what might be called a ball of fire. Planets and all other stars also occasionally have spreading hair. But sometimes [c] there is a comet in the western sky, usually a terrifying star and not easily expiated: for instance, during the civil disorder in the consulship [d] of Octavius, and again during the war [e] between Pompey and Caesar, or in our day about the time of the poisoning which secured the bequest of the empire by Claudius Caesar to Domitius Nero,[f] and thereafter during Nero's principate shining almost continuously and with a terrible glare. People think that it matters in what direction a comet darts, what star's strength it borrows, what shapes it resembles, and in what

Courses of comets.

Comets as portents.

[d] 43 B.C.

[e] 49, 48 B.C.

[f] Nero had succeeded his stepfather, 54 B.C., before he secured his position by murdering Britannicus.

93 locis emicet; tibiarum specie musicae arti portendere, obscenis autem moribus in verendis partibus signorum, ingeniis et eruditioni si triquetram figuram quadratamve paribus angulis ad aliquos perennium stellarum situs edat, venena fundere in capite septentrionalis austrinaeve serpentis.

Cometes in uno totius orbis loco colitur in templo Romae, admodum faustus divo Augusto iudicatus ab ipso, qui incipiente eo apparuit ludis quos faciebat Veneri Genetrici non multo post obitum patris
94 Caesaris in collegio ab eo instituto. namque his verbis id gaudium prodit: 'Iis ipsis ludorum meorum diebus sidus crinitum per septem dies in regione caeli quae sub septentrionibus est conspectum est.[1] id oriebatur circa undecimam horam diei clarumque et omnibus e terris conspicuum fuit. eo sidere significari volgus credidit Caesaris animam inter deorum immortalium numina receptam, quo nomine id insigne simulacro capitis eius, quod mox in foro consecravimus, adiectum est.' haec ille in publicum: interiore gaudio sibi illum natum seque in eo nasci interpretatus est; et, si verum fatemur, salutare id terris fuit.

Sunt qui et haec sidera perpetua esse credant suoque ambitu ire, sed non nisi relicta ab sole cerni,

[1] est *add.* (*vel* id *om.*) *Rackham.*

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[a] Between the Great and Little Bear.

places it shines; that if it resembles a pair of flutes it is a portent for the art of music, in the private parts of the constellations it portends immorality, if it forms an equilateral triangle or a rectangular quadrilateral in relation to certain positions of the fixed stars, it portends men of genius and a revival of learning, in the head of the Northern[a] or the Southern[b] Serpent it brings poisonings.

Worship of comets.

The only place in the whole world where a comet is the object of worship is a temple at Rome. His late Majesty Augustus had deemed this comet very propitious to himself; as it had appeared at the beginning of his rule, at some games which, not long after the decease of his father Caesar, as a member of the college founded by him he was celebrating in honour of Mother Venus. In fact he made public the joy that it gave him in these words: 'On the very days of my Games a comet was visible for seven days in the northern part of the sky. It was rising about an hour before sunset, and was a bright star, visible from all lands. The common people believed that this star signified the soul of Caesar received among the spirits of the immortal gods, and on this account the emblem of a star was added to the bust of Caesar that we shortly afterwards dedicated in the forum.' This was his public utterance, but privately he rejoiced because he interpreted the comet as having been born for his own sake and as containing his own birth within it; and, to confess the truth, it did have a healthgiving influence over the world.

Some persons think that even comets are everlasting, and travel in a special circuit of their own, but are not visible except when the sun leaves them;

[b] In the hand of Ophiuchus (*Anguitenens*).

alii vero qui nasci umore fortuito et ignea vi, ideoque [1] solvi.

95 XXIV. Idem Hipparchus numquam satis laudatus, ut quo nemo magis adprobaverit cognationem cum homine siderum animasque nostras partem esse caeli, novam stellam [2] in aevo suo genitam deprehendit, eiusque motu qua [3] fulsit ad dubitationem est adductus anne hoc saepius fieret moverenturque et eae quas putamus adfixas, ideoque [4] ausus rem etiam deo inprobam, adnumerare posteris stellas ac sidera ad nomen expungere organis excogitatis per quae singularum loca atque magnitudines signaret, ut facile discerni posset ex eo non modo an obirent ac nascerentur sed an omnino aliquae transirent moverenturque, item an crescerent minuerenturque, caelo in hereditate cunctis relicto, si quisquam qui cretionem eam caperet inventus esset.

96 XXV. Emicant et faces non nisi cum decidunt visae, qualis Germanico Caesare gladiatorium spectaculum edente praeter ora populi meridiano transcucurrit. duo genera earum: alterum [5] lampadas vocant, plane faces, alterum bolidas, quale Mutinensibus malis visum est. distant quod faces vestigia

[1] eoque? *Rackham.*
[2] *Detlefsen*: stellam et aliam, stellam vel aliam.
[3] *v.l.* qua die.
[4] *v.l.* idemque.
[5] alterum *add. Rackham.*

[a] Possibly the text should be altered to give 'and are dissolved into them.'

there are others, however, who hold that they spring into existence out of chance moisture and fiery force, and consequently [a] are dissolved.

The astronomy of Hipparchus.

XXIV. Hipparchus before-mentioned, who can never be sufficiently praised, no one having done more to prove that man is related to the stars and that our souls are a part of heaven, detected a new star that came into existence during his lifetime; the movement of this star in its line of radiance led him to wonder whether this was a frequent occurrence, whether the stars that we think to be fixed are also in motion; and consequently he did a bold thing, that would be reprehensible even for God—he dared to schedule the stars for posterity, and tick off the heavenly bodies by name in a list, devising machinery by means of which to indicate their several positions and magnitudes, in order that from that time onward it might be possible easily to discern not only whether stars perish and are born, but whether some are in transit and in motion, and also whether they increase and decrease in magnitude—thus bequeathing the heavens as a legacy to all mankind, supposing anybody had been found to claim that inheritance!

Meteors, varieties and instances of

XXV. There are also meteoric lights that are only seen when falling, for instance one that ran across the sky at midday in full view of the public when Germanicus Caesar was giving a gladiatorial show. Of these there are two kinds: one sort are called *lampades*, which means 'torches,' the other *bolides* (missiles),—that is the sort that appeared at the time of the disasters of Modena.[b] The difference

[b] When Decimus Brutus was besieged there by Antony, 44 B.C.

longa faciunt priore ardente[1] parte, bolis vero perpetua ardens longiorem trahit limitem.

XXVI. Emicant et trabes simili modo, quas δοκοὺς vocant, qualis cum Lacedaemonii classe victi
97 imperium Graeciae amisere. fit et caeli ipsius hiatus, quod vocant chasma, (XXVII) fit et sanguinea species et, quo nihil terribilius mortalium timori est, incendium ad terras cadens inde, sicut Olympiadis centesimae septimae anno tertio, cum rex Philippus Graeciam quateret. atque ego haec statis temporibus naturae vi[2] ut cetera arbitror existere, non, ut plerique, variis de causis quas ingeniorum acumen excogitat; quippe ingentium malorum fuere praenuntia, sed ea accidisse non quia haec facta sunt arbitror, verum haec ideo facta quia incasura erant illa, raritate autem occultam eorum esse rationem, ideoque non sicut exortus supra dictos defectusque et multa alia nosci.

98 XXVIII. Cernuntur et stellae cum sole totis diebus, plerumque et circa solis orbem ceu spiceae coronae et versicolores circuli, qualiter Augusto Caesare in prima iuventa urbem intrante post obitum patris ad nomen ingens capessendum. existunt eaedem coronae circa lunam et circa nobilia astra caeloque inhaerentia. XXIX. Circa solem arcus

[1] ardentes? *Rackham.*
[2] vi *add. Mayhoff* (*cf.* 191).

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[a] At Cnidus, 394 B.C.
[b] 349 B.C.
[c] I.e. his great-uncle Julius Caesar, who not long before his death adopted Octavian into the Gens Julia as his heir: of this Augustus (then aged $18\frac{1}{2}$) learnt on crossing from Apollonia and landing near Brindisi shortly after Caesar's murder.

between them is that 'torches' make long tracks, with their front part glowing, whereas a 'bolis' glows throughout its length, and traces a longer path.

XXVI. Other similar meteoric lights are 'beams,' in Greek *dokoi*, for example one that appeared when the Spartans were defeated[a] at sea and lost the empire of Greece. There also occurs a yawning of the actual sky, called *chasma*, (XXVII) and also something that looks like blood, and a fire that falls from it to the earth—the most alarming possible cause of terror to mankind; as happened in the third year[b] of the 107th Olympiad, when King Philip was throwing Greece into disturbance. My own view is that these occurrences take place at fixed dates owing to natural forces, like all other events, and not, as most people think, from the variety of causes invented by the cleverness of human intellects; it is true that they were the harbingers of enormous misfortunes, but I hold that those did not happen because the marvellous occurrences took place but that these took place because the misfortunes were going to occur, only the reason for their occurrence is concealed by their rarity, and consequently is not understood as are the risings and setting of the planets described above and many other phenomena.

Solar and lunar halos.

XXVIII. Stars are also seen throughout the daytime in company with the sun, usually actually surrounding the sun's orb like wreaths made of ears of corn and rings of changing colour—for instance, when Augustus Caesar in early manhood entered the city after the death of his father[c] to assume his mighty surname. Similar haloes occur round the moon and round the principal fixed stars. XXIX. A bow appeared round the sun in the consulship of Lucius

adparuit L. Opimio Q. Fabio coss., orbis L. Porcio M'. Acilio, circulus rubri coloris L. Iulio P. Rutilio coss.

XXX. Fiunt prodigiosi et longiores solis defectus, qualis occiso dictatore Caesare et Antoniano bello
99 totius paene anni pallore continuo. XXXI. Et rursus soles plures simul cernuntur, nec supra ipsum nec infra sed ex obliquo, numquam iuxta nec contra terram, nec noctu sed aut oriente aut occidente. semel et meridie conspecti in Bosporo produntur, qui ab matutino tempore duraverunt in occasum. trinos soles antiqui saepius videre, sicut Sp. Postumio Q. Mucio et Q. Marcio M. Porcio et M. Antonio P. Dolabella et M. Lepido L. Planco coss., et nostra aetas vidit divo Claudio principe, consulatu eius Cornelio Orfito collega. plures quam tres simul visi ad hoc aevi numquam produntur.

XXXII. Lunae quoque trinae, ut Cn. Domitio C. Fannio consulibus, apparuere.

100 XXXIII. Quod plerique appellaverunt soles nocturnos, lumen de caelo noctu visum est C. Caecilio Cn. Papirio consulibus et saepe alias, ut diei species nocte luceret.

XXXIV. Clipeus ardens ab occasu ad ortum

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[a] 121 B.C. [b] 114 B.C. [c] 90 B.C.
[d] 174 B.C. [e] 118 B.C. [f] 44 B.C.
[g] 42 B.C. [h] A.D. 51. [i] 222 B.C.
[j] 113 B.C. [k] 86 B.C.

Opimius and Quintus Fabius,[a] a hoop in that of Gaius Porcius and Manius Acilius,[b] and a red ring in that of Lucius Julius and Publius Rutilius.[c]

Solar Eclipses.

XXX. Portentous and protracted eclipses of the sun occur, such as the one after the murder of Caesar the dictator and during the Antonine war which caused almost a whole year's continuous gloom. XXXI. Again, several suns are seen at once, neither above nor below the real sun but at an angle with it, never alongside of nor opposite to the earth, and not at night but either at sunrise or at sunset. It is also reported that once several suns were seen at midday at the Bosphorus, and that these lasted from dawn till sunset. In former times three suns have often been seen at once, for example in the consulships of Spurius Postumius and Quintus Mucius [d] of Quintus Marcius and Marcus Porcius,[e] of Marcus Antonius and Publius Dolabella [f] and of Marcus Lepidus and Lucius Plancus;[g] and our generation saw this during the principate of his late Majesty Claudius, in his consulship, when Cornelius Orfitus was his colleague.[h] It is not stated that more than three suns at a time have ever been seen hitherto.

Other astronomical portents.

XXXII. Also three moons have appeared at once, for instance in the consulship [i] of Gnaeus Domitius and Gaius Fannius.

XXXIII. A light from the sky by night, the phenomenon usually called 'night-suns,' was seen in the consulship [j] of Gaius Caecilius and Gnaeus Papirius and often on other occasions causing apparent daylight in the night.

XXXIV. In the consulship [k] of Lucius Valerius

scintillans transcucurrit solis occasu L. Valerio C. Mario consulibus.

XXXV. Scintillam visam[1] e stella cadere et augeri terrae adpropinquantem, at postquam lunae magnitudine[2] facta sit, inluxisse ceu nubilo die, dein, cum in caelum se reciperet, lampadem factam semel umquam proditur Cn. Octavio C. Scribonio consulibus. vidit id Silanus proconsul cum comitatu suo.

XXXVI. Fieri videntur et discursus stellarum, numquam temere ut non ex ea parte truces venti cooriantur.

101 XXXVII. Existunt stellae et in mari terrisque. vidi nocturnis militum vigiliis inhaerere pilis pro vallo fulgurum effigie eas, et antemnis navigantium aliisque navium partibus cum[3] vocali quodam sono insistunt ut volucres sedem ex sede mutantes, graves, cum solitariae venere, mergentesque navigia, et si in carinae ima deciderint, exurentes, geminae autem salutares et prosperi cursus praenuntiae, quarum adventu fugari diram illam ac minacem appellatamque Helenam ferunt, et ob id Polluci ac Castori iis nomina[4] adsignant, eosque in mari deos invocant. hominum quoque capita vespertinis horis magno praesagio circumfulgent, omnia incerta ratione et in naturae maiestate abdita.

102 XXXVIII. Hactenus de mundo ipso sideribusque. nunc reliqua caeli memorabilia. namque et hoc

[1] visam *add. Mayhoff.*
[2] *v.l.* in lunae magnitudinem.
[3] *Mayhoff*: ceu.
[4] *Detlefsen*: id nomen *aut* id numen.

[a] 66 B.C.

and Gaius Marius a burning shield scattering sparks ran across the sky at sunset from west to east.

XXXV. In the consulship[a] of Gnaeus Octavius and Gaius Scribonius a spark was seen to fall from a star and increase in size as it approached the earth, and after becoming as large as the moon it diffused a sort of cloudy daylight, and then returning to the sky changed into a torch; this is the only record of this occurring. It was seen by the proconsul Silanus and his suite.

XXXVI. Also stars appear to shoot to and fro; this invariably portends the rise of a fierce hurricane from the same quarter.

XXXVII. Stars also come into existence at sea and on land. I have seen a radiance of star-like appearance clinging to the javelins of soldiers on sentry duty at night in front of the rampart; and on a voyage stars alight on the yards and other parts of the ship, with a sound resembling a voice, hopping from perch to perch in the manner of birds. These when they come singly are disastrously heavy and wreck ships, and if they fall into the hold burn them up. If there are two of them, they denote safety and portend a successful voyage; and their approach is said to put to flight the terrible star called Helena: for this reason they are called Castor and Pollux, and people pray to them as gods for aid at sea. They also shine round men's heads at evening time; this is a great portent. All these things admit of no certain explanation; they are hidden away in the grandeur of nature.

XXXVIII. So much as to the world itself and the stars. Now the remaining noteworthy facts as to the heavens: for the name 'heaven' was also given

Atmospher[ic] phenomen[a]

caelum appellavere maiores quod alio nomine aera, omne quod inani simile vitalem hunc spiritum fundit. Infra lunam haec sedes, multoque inferior (ut animadverto propemodum constare), infinitum ex superiore natura aeris, infinitum et terreni halitus miscens utraque sorte confunditur. hinc nubila, tonitrua et alia fulmina, hinc grandines, pruinae, imbres, procellae, turbines, hinc plurima mortalium
103 mala et rerum naturae pugna secum. terrena in caelum tendentia deprimit siderum vis, eademque quae sponte non subeant ad se trahit. decidunt imbres, nebulae subeunt, siccantur amnes, ruunt grandines, torrent radii et terram in medio mundi [1] undique impellunt, iidem infracti resiliunt et quae potavere [2] auferunt secum. vapor ex alto cadit rursumque in altum redit. venti ingruunt inanes, iidemque cum rapina remeant. tot animalium haustus spiritum e sublimi aere [3] trahit, at ille contra nititur, tellusque ut inani caelo spiritum re-
104 fundit.[4] sic ultro citro conmeante natura ut tormento aliquo mundi celeritate discordia accenditur nec stare pugnae licet, sed adsidue rapta convolvitur et circa terram inmenso rerum causas globo ostendit, subinde per nubes caelum aliud atque aliud [5] obtexens. ventorum hoc regnum. itaque praecipua eorum

[1] *Detlefsen*: terram mediam *aut* medio *aut* mediam.
[2] *Dalec*: potuere.
[3] aere *add. Rackham.*
[4] *Rackham*: fundit *aut* infundit.
[5] atque aliud *add. vet. apud Dalec* (*Brotier*).

by our ancestors to this which is otherwise designated 'air'—the whole of that apparently empty space which pours forth this breath of life. This region below the moon, and a long way below it (as I notice is almost universally agreed), blends together an unlimited quantity from the upper element of air and an unlimited quantity of terrestrial vapour, being a combination of both orders. From it come clouds, thunder-claps and also thunder-bolts, hail, frost, rain, storms and whirlwinds; from it come most of mortals' misfortunes, and the warfare between the elements of nature. The force of the stars presses down terrestrial objects that strive to move towards the sky, and also draws to itself things that lack spontaneous levitation. Rain falls, clouds rise, rivers dry up, hailstorms sweep down; rays scorch, and impinging from every side on the earth in the middle of the world, then are broken and recoil and carry with them the moisture they have drunk up. Steam falls from on high and again returns on high. Empty winds sweep down, and then go back again with their plunder. So many living creatures draw their breath from the upper air; but the air strives in the opposite direction, and the earth pours back breath to the sky as if to a vacuum. Thus as nature swings to and fro like a kind of sling, discord is kindled by the velocity of the world's motion. Nor is the battle allowed to stand still, but is continually carried up and whirled round, displaying in an immense globe that encircles the world the causes of things, continually overspreading another and another heaven interwoven with the clouds. This is the realm of the winds. Consequently their nature is here pre-eminent, and almost includes all the rest of

natura ibi et ferme reliquas complexa aeris[1] causas, quoniam et tonitruum et fulminum iactus horum violentiae plerique adsignant, quin et ideo lapidibus pluere interim, quia vento sint rapti; et multa similiter. quam ob rem simul plura dicenda sunt.

105 XXXIX. Tempestatum imbriumque[2] quasdam statas esse causas, quasdam vero fortuitas aut adhuc rationis inconpertae, manifestum est. quis enim aestates et hiemes quaeque in temporibus annua vice intelleguntur siderum motu fieri dubitet? ut solis ergo natura temperando intellegitur anno, sic reliquorum quoque siderum propria est cuiusque[3] vis et ad suam cuique naturam fertilis. alia sunt in liquorem soluti umoris fecunda, alia concreti in pruinas aut coacti in nives aut glaciati in grandines, alia flatus, alia teporis, alia vaporis, alia roris, alia frigoris.[4] nec vero haec tanta debent existimari quanta cernuntur, cum esse eorum nullum minus
106 luna tam inmensae altitudinis ratio declaret. igitur in suo quaeque motu naturam suam exercent, quod manifestum Saturni maxime transitus imbribus faciunt. nec meantium modo siderum haec vis est sed multorum etiam adhaerentium caelo, quotiens errantium accessu inpulsa aut coniectu radiorum exstimulata sunt, qualiter in suculis sentimus accidere, quas Graeci ob id pluvio nomine hyadas[5]

[1] *Detlefsen*: complexa a se *aut* se (complexa eas, *cf.* 67 *fin. Mayhoff*).
[2] *Mayhoff*: rerumque.
[3] *Mayhoff*: quibusque.
[4] *v.l.* rigoris.
[5] hyadas *om. vulg.* (*cf.* § 8).

the phenomena caused by the air, as most men attribute the hurling of thunderbolts and lightning to the winds' violence, and indeed hold that the cause of the rain of stones that sometimes occurs is that the stones are caught up by the wind; and likewise many other things. On this account more facts have to be set out at the same time.

Rain.

XXXIX. Storms and rain obviously have some regular causes, but some that are accidental, or at all events not hitherto explained. For who can doubt that summer and winter and the yearly vicissitudes observed in the seasons are caused by the motion of the heavenly bodies? Therefore as the nature of the sun is understood to control the year's seasons, so each of the other stars also has a force of its own that creates effects corresponding to its particular nature. Some are productive of moisture dissolved into liquid, others of moisture hardened into frost or coagulated into snow or frozen into hail, others of a blast of air, others of warmth or heat, others of dew, others of cold. But it must not be thought that the stars are of the size that they appear to the sight, since the consideration of their immense altitude proves that none of them is smaller than the moon. Consequently each of them exercises its own nature in its own motion, a fact which the transits of Saturn in particular make clear by their storms of rain. Nor does this power belong to the moving stars only, but also to many of those that are fixed to the sky, whenever they are impelled forward by the approach of the planets or goaded on by the impact of their rays, as we observe occurring in the case of the Little Pigs, the Greek name for which is consequently the Hyades, a word

Influence of heavenly bodies on weather.

appellant. quin et sua sponte quaedam statisque temporibus, ut haedorum exortus. Arcturi vero sidus non ferme sine procellosa grandine emergit.

107 XL. Nam caniculae exortu accendi solis vapores quis ignorat, cuius sideris effectus amplissimi in terra sentiuntur? fervent maria exoriente eo, fluctuant in cellis vina, moventur stagna. orygem appellat Aegyptus feram quam in exortu eius contra stare et contueri tradit ac velut adorare cum sternuerit. canes quidem toto eo spatio maxime in rabiem agi non est dubium.

108 XLI. Quin partibus quoque signorum quorundam sua vis inest, ut autumnali aequinoctio brumaque, cum tempestatibus confici sidus intellegimus, nec imbribus tantum tempestatibusque sed multis et corporum et ruris experimentis. adflantur alii sidere, alii commoventur statis temporibus alvo, nervis, capite, mente. olea et populus alba et salices solstitio folia circumagunt. floret ipso brumali die suspensa in tectis arentis herba pulei, rumpuntur
109 intentae spiritu membranae. miretur hoc qui non observet cotidiano experimento herbam unam, quae vocatur heliotropium, abeuntem solem intueri semper omnibusque horis cum eo verti vel nubilo obumbrante. iam quidem lunari potestate ostrearum conchyliorumque et concharum omnium corpora augeri ac rursus minui, quin et soricum fibras re-

[a] Ὑάδες from ὕειν 'to rain,' not from ὗς 'a pig.'

denoting rain.[a] Indeed some stars move of themselves and at fixed times—compare the rising of the Kids. But the rising of the constellation Arcturus is almost always accompanied by a hail-storm.

XL. For who is not aware that the heat of the sun increases at the rising of the Lesser Dog-star, whose effects are felt on earth very widely? At its rise the seas are rough, wine in the cellars ripples in waves, pools of water are stirred. There is a wild animal in Egypt called the gazelle that according to the natives stands facing this dog-star at its rise, and gazing at it as if in worship, after first giving a sneeze. It is indeed beyond doubt that dogs throughout the whole of that period are specially liable to rabies.

XLI. Moreover also the parts of some constellations have an influence of their own—for instance at the autumnal equinox and at mid-winter, when we learn by the storms that the sun is completing its orbit; and not only by falls of rain and storms, but by many things that happen to our bodies and to the fields. Some men are paralysed by a star, others suffer periodic disturbances of the stomach or sinews or head or mind. The olive and white poplar and willow turn round their leaves at the solstice. Fleabane hung up in the house to dry flowers exactly on midwinter day, and inflated skins burst. This may surprise one who does not notice in daily experience that one plant, called heliotrope, always looks towards the sun as it passes and at every hour of the day turns with it, even when it is obscured by a cloud. Indeed persistent research has discovered that the influence of the moon causes the shells of oysters, cockles and all shell-fish to grow larger and again smaller in bulk, and moreover that

and on animals and plants.

spondere numero lunae exquisivere diligentiores, minimumque animal, formicam, sentire vires sideris
110 interlunio semper cessantem. quo turpior homini inscitia est fatenti praecipue iumentorum quorundam in oculis morbos cum luna increscere ac minui. patrocinatur vastitas caeli[1] inmensa discreta altitudine[2] in duo atque septuaginta signa, hoc est rerum aut animantium effigies in quas digessere caelum periti. in his quidam mille sexcentas adnotavere stellas, insignes scilicet effectu visuve, exempli gratia in cauda tauri septem quas appellavere Vergilias, in fronte suculas, Booten quae sequitur Septem Triones.

111 XLII. Extra has causas non negaverim exsistere imbres ventosque, quoniam umidam a terra, alias vero propter vaporem fumidam exhalari caliginem certum est, nubesque e[3] liquore[4] egresso in sublime aut ex aere coacto in liquorem gigni. densitas earum corpusque haut dubio coniectatur argumento, cum solem obumbrent, perspicuum alias etiam urinantibus in quamlibet profundam aquarum altitudinem.

112 XLIII. Igitur non eam infitias posse in has et ignes superne stellarum decidere (quales sereno saepe cernimus, quorum ictu concuti aera verum est, quando et tela vibrata stridunt), cum vero in nubem perveniunt, vaporem dissonum gigni ut candente ferro in aquam demerso et fumidum verticem volvi.

[1] *v.l.* rei (*et* discretae *Rackham*).
[2] latitudine *Brotier*.
[3] e *add. Rackham*.
[4] vapore *edd.* (*sic Aristoteles*).

[a] I.e. the number of days from the new moon.
[b] The Hyades, see § 106.
[c] The Oxherd.
[d] The Wain, or Ursa Major and Ursa Minor.

the phases of the moon[a] affect the tissues of the shrew-mouse, and that the smallest animal, the ant, is sensitive to the influence of the planet and at the time of the new moon is always slack. This makes ignorance all the more disgraceful to man, especially as he admits that with some cattle diseases of the eyes increase and diminish with the moon. His excuse is the heaven's vastness, being divided at an enormous height into 72 signs, that is, shapes of things or of animals into which the learned have mapped out the sky. In them they have indeed noted 1600 stars as being specially remarkable for their influence or their appearance, for instance the seven which they have named the Pleiades in the tail of the Bull and the Little Pigs[b] in his forehead, and Bootes,[c] the star that follows the Seven Plough-oxen.[d]

Evaporation from the earth.

XLII. I would not deny that rain and wind can arise from other causes than these; it is certain that the earth exhales a damp mist and at other times a smoky one due to vapour, and that clouds are formed out of moisture rising to a height or air condensed into moisture. Their density and bulk are conjectured with certain inference from the fact that they obscure the sun, which is otherwise visible even to those diving into water to whatever depth.

Storms caused by stars.

XLIII. Consequently I would not go against the view that it is also possible for the fires of stars to fall from above into the clouds (as we often see happen in fine weather, and the impact of these fires unquestionably shakes the air since even weapons when flung make a hissing noise); and that when they reach the cloud, a hissing steam is produced, just as when red-hot iron is plunged into water, and a coil of

hinc nasci procellas, et si in nube luctetur flatus aut vapor, tonitrua edi, si erumpat ardens, fulmina, si longiore tractu nitatur, fulgetras. his findi nubem, illis perrumpi, et esse tonitrua inpactorum ignium plagas ideoque protinus coruscare igneas nubium
113 rimas. posse et repulsu siderum depressum qui a terra meaverit spritum nube cohibitum tonare, natura strangulante sonitum dum rixetur, edito fragore cum erumpat ut in membrana spiritu intenta. posse et attritu, dum praeceps feratur, illum quisquis est spiritum accendi. posse et conflictu nubium elidi, ut duorum lapidum, scintillantibus fulgetris. sed haec omnia esse fortuita; hinc bruta fulmina et vana, ut quae nulla veniant ratione naturae, his percuti montes, his maria omnesque alios inritos iactus; illa vero fatidica ex alto, statisque de causis et ex suis venire sideribus.

114 XLIV. Simili modo ventos vel potius flatus posse et arido siccoque anhelitu terrae gigni non negaverim, posse et aquis aera exspirantibus qui neque in nebulam densetur nec crassescat in nubes, posse et solis inpulsu agi, quoniam ventus haut aliud intellegatur

[a] Those mentioned at the beginning of the chapter.

smoke whirls up. And I agree that these produce storms, and if there is wind or steam struggling in the cloud, it gives out claps of thunder, if it bursts out on fire, flashes of lightning, if it forces its way on a longer track, heat-lightning. The latter cleaves the cloud, the flashes burst through it, and thunder-claps are the blows of the fires colliding, causing fiery cracks at once to flash out in the clouds. It is also possible for breath emerging from the earth, when pressed down by the counter-impact of the stars, to be checked by a cloud and so cause thunder, nature choking down the sound while the struggle goes on but the crash sounding when the breath bursts out, as when a skin is stretched by being blown into. It is also possible for this breath, whatever it is, to be set on fire by the friction during its headlong progress. It is also possible for it to be struck out by the impact of the clouds, as by that of two stones, with heat-lightning flashing out like sparks. But all these occurrences are accidental—they cause mere senseless and ineffectual thunder-claps, as their coming obeys no principle of nature—they merely cleave mountains and seas, and all their other blows are ineffectual; but the former [a] are prophetical and sent from on high, they come by fixed causes and from their own stars.

Air currents caused by contour of the earth.

XLIV. Similarly I am not prepared to deny that it is possible for winds or rather gusts of air to be produced also by a dry and parched breath from the earth, and also possible when bodies of water breathe out a vapour that is neither condensed into mist or solidified into clouds; and also they may be caused by the driving force of the sun, because wind is understood to be nothing else than a wave of air;

quam fluctus aeris, pluribusque etiam modis. namque et e fluminibus ac sinubus et e mari videmus, et quidem tranquillo, et alios quos vocant altanos e terra consurgere; qui cum e mari redeunt, tropaei vocantur, si pergunt, apogei.

115 Montium vero flexus crebrique vertices et conflexa cubito aut confracta in umeros iuga ac [1] concavi vallium sinus, scindentes inaequalitate ideo resultantem aera (quae causa etiam voces multis in locis reciprocas facit sine fine) ventos generant. iam quidam et specus, qualis in Dalmatiae ora vasto praeceps hiatu, in quem deiecto levi pondere quamvis tranquillo die turbini similis emicat procella; nomen loco est Senta. quin et in Cyrenaica provincia rupes quaedam austro traditur sacra, quam profanum sit attrectari hominis manu confestim austro volvente harenas. in domibus etiam multis manu facta [2] inclusa opacitate conceptacula auras suas habent. adeo [3] causa non deest.

116 XLV. Sed plurimum interest flatus sit an ventus. illos statos atque perspirantes, quos non tractus aliquis verum terrae sentiunt, qui non aurae,[4] non procellae,[5] sed mares appellatione quoque ipsa venti sunt, sive adsiduo mundi motu et contrario siderum occursu nascuntur, sive hic est ille generabilis rerum naturae spiritus huc illuc tamquam in utero aliquo

[1] ac *add. Rackham.*
[2] *v.l.* madefacta.
[3] ideo? *Rackham.*
[4] *Rackham*: aura.
[5] *Rackham*: procella.

and in more ways as well. For we see winds arising both from rivers and bays and from the sea even when calm, and others, called *altani*, arising from the land; the latter when they come back again from the sea are called turning winds, but if they go on, offshore winds.

The windings of mountains and their clustered peaks and ridges curved in an elbow or broken off into shoulders, and the hollow recesses of valleys, cleaving with their irregular contours the air that is consequently reflected from them (a phenomenon that in many place causes words spoken to be endlessly echoed) are productive of winds. So again are caverns, like the one with an enormous gaping mouth on the coast of Dalmatia, from which, if you throw some light object into it, even in calm weather a gust like a whirlwind bursts out; the name of the place is Senta. Also it is said that in the province of Cyrenaica there is a certain cliff, sacred to the South wind, which it is sacrilege for the hand of man to touch, the South wind immediately causing a sand-storm. Even manufactured vessels in many houses if shut up in the dark have peculiar exhalations. Thus there must be some cause for this.

XLV. But there is a great difference between a gust of air and a wind. The latter, regular and blowing steadily, and felt not by some particular tract only but by whole countries, and not being breezes nor tempests but *winds*—even their name being a masculine word—whether they are caused by the continuous motion of the world and the impact of the stars travelling in the opposite direction or whether wind is the famous 'breath' that generates the universe by fluctuating to and fro as in a *Causes of winds.*

vagus, sive dispari errantium siderum ictu radiorumque multiformi iactu flagellatus aer, sive a suis sideribus exeunt his propioribus sive ab illis caelo adfixis cadunt, palam est illos quoque legem naturae habere non ignotam etiamsi nondum percognitam.

117 Viginti amplius auctores Graeci veteres prodidere de his observationes. quo magis miror orbe discordi et in regna, hoc est in membra, diviso tot viris curae fuisse tam ardua inventu, inter bella praesertim et infida hospitia, piratis etiam omnium mortalium hostibus transituros fama terrentibus,[1] ut hodie quaedam in suo quisque tractu ex eorum commentariis qui numquam eo accessere verius noscat quam indigenarum scientia, nunc vero pace tam festa, tam gaudente proventu literarum [2] artiumque principe, omnino nihil addisci nova inquisitione,
118 immo ne veterum quidem inventa perdisci. non erant maiora praemia in multos dispersa fortunae magnitudine, et ista plures sine praemio alio quam posteros iuvandi eruerunt. mores hominum senuere, non fructus, et inmensa multitudo aperto quodcumque est mari hospitalique litorum omnium adpulsu navigat,

[1] *Mayhoff*: transitus famae terrentibus *aut* terrentibus.
[2] *Mayhoff*: rerum.

sort of womb, or air whipped by the irregular impact of the planets and the non-uniform emission of their rays, or whether they issue forth from these nearer stars which are their own or fall from those stars which are fixed in the heaven—it is manifest that the winds too obey a law of nature that is not unknown, even if not yet fully known.

Persistence of meteorological study.

More than twenty Greek authors of the past have published observations about these subjects. This makes me all the more surprised that, although when the world was at variance, and split up into kingdoms, that is, sundered limb from limb, so many people devoted themselves to these abstruse researches, especially when wars surrounded them and hosts were untrustworthy, and also when rumours of pirates, the foes of all mankind, terrified intending travellers—so that now-a-days a person may learn some facts about his own region from the note-books of people who have never been there more truly than from the knowledge of the natives—yet now in these glad times of peace under an emperor who so delights in productions of literature and science, no addition whatever is being made to knowledge by means of original research, and in fact even the discoveries of our predecessors are not being thoroughly studied. The rewards were not greater when the ample successes were spread out over many students, and in fact the majority of these made the discoveries in question with no other reward at all save the consciousness of benefiting posterity. Age has overtaken the characters of mankind, not their revenues, and now that every sea has been opened up and every coast offers a hospitable landing, an immense multitude goes

sed lucri, non scientiae, gratia; nec reputat caeca mens et tantum avaritiae intenta id ipsum scientia posse tutius fieri. quapropter scrupulosius quam instituto fortassis conveniat operi tractabo ventos, tot milia navigantium cernens.

119 XLVI. Veteres quattuor omnino servavere per totidem mundi partes (ideo nec Homerus plures nominat) hebeti, ut mox iudicatum est, ratione; secuta aetas octo addidit nimis subtili atque concisa. proximis inter utramque media placuit ad brevem ex numerosa additis quattuor. sunt ergo bini in quattuor caeli partibus: ab oriente aequinoctiali Subsolanus, ab oriente brumali Volturnus (illum Apelioten, hunc Graeci Eurum appellant); a meridie Auster et ab occasu brumali Africus (Notum et Liba nominant); ab occasu aequinoctiali Favonius, ab occasu solstitiali Corus (Zephyrum et Argesten vocant); a septentrionibus Septentrio, interque eum et exortum solstitialem Aquilo (Aparctias et Boreas
120 dicti). numerosior ratio quattuor his interiecerat, Thrascian media regione inter Septentrionem et occasum solstitialem, itemque Caecian media inter Aquilonem et exortum aequinoctialem ab ortu solstitiali, Phoenica media regione inter ortum

on voyages—but their object is profit not knowledge; and in their blind engrossment with avarice they do not reflect that knowledge is a more reliable means even of making profit. Consequently in view of these thousands of persons who go on voyages I will give a more detailed account of the winds than is perhaps suited to the task I have set in hand.

Designation of winds.

XLVI. The ancients noticed four winds in all, corresponding to the four quarters of the world (this is the reason why even Homer mentions no more)—a dull-witted system, as it was soon afterwards considered; the following age added eight—this system on the other hand was too subtle and meticulous. Their successors adopted a compromise, adding to the short list four winds from the long one. There are consequently two winds in each of the four quarters of the heaven: Subsolanus blowing from the equinoctial sunrise (E). and Vulturnus from the winter sunrise (S.E.)—the former designated by the Greeks Apeliotes, the latter Eurus; Auster from the sun at midday (S.) and Africus from the winter sunset (S.W.)—named in Greek Notus and Libs; Favonius from the equinoctial sunset (W.), Corus from the sunset at the solstice (N.W.)—these the Greeks call Zephyr and Argestes; Septentrio from the North and Aquilo between him and sunrise at the solstice (N.E.)—called in Greek Aparctias and Boreas. The more numerous scheme had inserted four between these: Thrascias (N.N.W.) in the space between Septentrio (N.) and the sunset at the solstice (N.W.) and also Caecias (E.N.E.) in the space between Aquilo (N.E.) and the equinoctial sunrise (E.) on the side of the sunrise at the solstice, and Phoenix

brumalem et meridiem, item inter Liba et Notum conpositum ex utroque medium inter meridiem et hibernum occidentem Libonotum. nec finis: alii quippe Mesen nomine etiamnum addidere inter Borean et Caecian, et inter Eurum Notumque Euronotum. sunt enim quidam peculiares quibusque gentibus venti, non ultra certum procedentes tractum, ut Atheniensibus Sciron, paulo ab Argeste deflexus, reliquae Graeciae ignotus: aliubi flatus
121 idem Olympias vocatur: consuetudo omnibus his nominibus Argesten intellegi.[1] et Caecian aliqui vocant Hellespontian, et eosdem alii aliter. item in Narbonensi provincia clarissimus ventorum est Circius nec ullo violentia inferior, Ostiam plerumque secto [2] Ligustico mari perferens; idem non modo in reliquis partibus caeli ignotus est, sed ne Viennam quidem eiusdem provinciae urbem attingens paucis ante milibus iugi modici occursu tantus ille ventus coercetur. et Austros in Aegyptum penetrare negat Fabianus: quo fit manifesta lex naturae ventis etiam et tempore et fine dicto.

122 XLVII. Ver ergo aperit navigantibus maria, cuius in principio Favonii hibernum molliunt caelum sole Aquari XXV optinente partem: is dies sextus Februarias ante idus. conpetit ferme et hoc

[1] intellegit *Mayhoff.* [2] *Mayhoff*: recto *aut* recta.

(S.S.E.) in the space between winter sunrise (S.E.) and midday (S.), and also between Libs (S.W.) and Notus (S.) the combination of the two, Libonotus (S.S.W.), midway between midday (S.) and winter sunset (S.W.). Nor is this the end, inasmuch as others have also added one named Meses between Boreas (N.E.) and Caecias (E.N.E.), and Euronotus between Eurus (S.E.) and Notus (S.). There are also certain winds peculiar to particular races, which do not go outside a special region, e.g. the Athenians have Sciron, slightly diverging from Argestes (N.W.), a name unknown to the rest of Greece—elsewhere the same breeze is called Olympias: customarily all these names are taken to denote Argestes. Some people call Caecias (E.N.E.) Hellespontias, and others have other variants for these names. Similarly in the province of Narbonne the most famous of the winds is Circius (W.N.W.), which is inferior to none other at all in force and which usually carries a vessel right across the Ligurian Sea to Ostia; the same wind is not only unknown in the remaining quarters of the sky, but it does not even touch Vienne, a city of the same province, a few miles before reaching which this mighty wind is checked by the obstacle of a moderate ridge of hills. Fabianus asserts that South winds also do not penetrate Egypt—which reveals the law of nature that even winds have their prescribed limits as well as seasons.

Seasons of winds.

XLVII. Accordingly the spring opens the seas to voyagers; at its beginning the West winds soften the wintry heaven, when the sun occupies the 25th degree of Aquarius; the date of this is Feb. 8. This also practically applies to all the winds whose

omnibus quos deinde ponam, per singulas intercalationes uno die anticipantibus rursusque lustro sequenti ordinem servantibus. Favonium quidam a. d. VIII kalendas Martias Chelidonian vocant ab hirundinis visu, nonnulli vero Ornithian ab adventu avium uno et LXX die post brumam flantem per dies novem. Favonio contrarius est quem Subsolanum
123 appellavimus. dat aestatem exortus Vergiliarum in totidem partibus Tauri sex diebus ante Maias idus, quod tempus Austrinum est, huic vento Septentrione contrario. ardentissimo autem aestatis tempore exoritur Caniculae sidus sole primam partem Leonis ingrediente, qui dies XV ante Augustas calendas est. huius exortum diebus octo ferme Aquilones antecedunt, quos Prodromos appellant.
124 post biduum autem exortus iidem Aquilones constantius perflant diebus XXX,[1] quos Etesias appellant. mollire eos creditur solis vapor geminatus ardore sideris, nec ulli ventorum magis stati sunt. Post eos rursus Austri frequentes usque ad sidus Arcturi quod exoritur undecim diebus ante aequinoctium
125 autumni. cum hoc Corus incipit; Corus autumnat: huic est contrarius Volturnus. post id aequinoctium diebus fere quattuor et quadraginta Vergiliarum occasus hiemem inchoat, quod tempus in III idus Novembres incidere consuevit; hoc est Aquilonis hiberni multumque aestivo illi dissimilis, cuius ex adverso est Africus. et ante brumam autem septem

[1] *v.ll.* diebus XL, his diebus.

positions I shall give afterwards, although every leap-year they come a day earlier, but they keep the regular rule in the period that follows. Certain persons give the name Chelidonias to the West wind on the 19th February, owing to the appearance of the swallow, but some call it Ornithias, from the arrival of the birds on the 71st day after the shortest day, when it blows for nine days. Opposite to the West wind is the wind that we have called Subsolanus (E.). The rise of the Pleiads in the same degrees of Taurus on May 10 brings summer; it is a period of South wind, Auster, the opposite of Septentrio. But in the hottest period of summer the Dog-star rises, when the sun is entering the first degree of Leo—this day is July 17. The Dog-star's rise is preceded for about eight days by North-east winds: these are called the Forerunners. But two days after his rising the North-east winds begin again, and continue blowing steadily for 30 days; these are called Etesian or Annual winds. They are believed to be softened by the sun's warmth being reinforced by the heat of the star; and they are the most regular of any of the winds. They are followed in turn by South winds, continuing to the rise of Arcturus, which occurs 40 days before the autumnal equinox. With the equinox begins the North-west wind; this, the opposite of Volturnus, marks the beginning of autumn. About 44 days after the autumnal equinox the setting of the Pleiads marks the beginning of winter, which it is customary to date on November 11; this is the period of the winter Aquilo, which is very unlike the summer one mentioned above; it is opposite to the South-west wind. But for six days before the shortest day and

diebus totidemque post eam sternitur mare alcyonum feturae, unde nomen hi dies traxere. reliquom tempus hiemat. nec tamen saevitia tempestatum cludit [1] mare: piratae primum coegere mortis periculo in mortem ruere et hiberna experiri maria, nunc idem hoc avaritia cogit.

126 XLVIII. Ventorum etiam frigidissimi sunt quos a septentrione diximus spirare et vicinus his Corus: hi et reliquos conpescunt et nubes abigunt. umidi Africus et praecipue Auster Italiae; narrant et in Ponto Caecian in se trahere nubes. sicci Corus et Volturnus praeterquam desinentes. nivales Aquilo et Septentrio; grandines Septentrio inportat et Corus. aestuosus Auster, tepidi Volturnus et Favonius; idem Subsolano sicciores, et in totum omnes a Septentrione et occidente sicciores quam a meridie
127 et oriente. saluberrimus autem omnium Aquilo, noxius Auster et magis siccus, fortassis quia umidus frigidior est; minus esurire eo spirante creduntur animantes. Etesiae noctu desinunt fere, et a tertia diei hora oriuntur; in Hispania et Asia ab oriente flatus est eorum, in Ponto ab Aquilone, reliquis in partibus a meridie. spirant autem et a bruma, cum vocantur Ornithiae, sed leniores et paucis diebus. Permutant et duo naturam cum situ, Auster, Africae
128 serenus, Aquilo nubilus. omnes venti vicibus suis spirant maiore ex parte ita ut [2] contrarius desinenti

[1] *v.l.* concludit.
[2] ita ut *Detlefsen*: aut ut *aut* autem (autem ut *Mayhoff*).

[a] It was thought that there was less likelihood of encountering pirates in the winter.

six days after it the sea calms down for the breeding of the halcyons from which these days derive their name. The rest of the time there is wintry weather. However, not even the fury of the storms closes the sea; pirates first compelled men by the threat of death to rush into death and venture on the winter seas,[a] but now avarice exercises the same compulsion.

Winds and weather.

XLVIII. The actually coldest winds are those that we have stated to blow from the North, and their neighbour Corus (N.W.); these check the other winds and also drive away the clouds. The South-west and especially the South are for Italy the damp winds; it is said that on the Black Sea the East-north-east also attracts clouds. The North-west and South-east are dry, except when they are falling. The North-east and North are snow winds; the North brings hailstorms, and so does the North-west. The South wind is hot, the South-east and West warm; the latter are also drier than the East wind, and in general all the northerly and westerly winds are drier than the southerly and easterly. The healthiest of all is the North wind; the South is harmful, and more so when dry, perhaps because when damp it is colder; living creatures are believed to be less hungry when it is blowing. Etesian winds usually cease at night and rise at eight o'clock in the morning; in Spain and Asia they are East winds, on the Black Sea North, and in other regions South. But they also begin to blow at midwinter (when they are called the Bird-winds), but more gently and only for a few days. Two winds also change their nature with their geographical position: the South wind in Africa is fine and the North-east cloudy. All the winds blow in their own turns, usually the one opposite to the one

incipiat. cum proximi cadentibus surgunt, a laevo latere in dextrum ut sol ambiunt. de ratione eorum menstrua quarta maxime luna decernit. iisdem autem ventis in contrarium navigatur prolatis pedibus, ut noctu plerumque adversa vela concurrant. Austro maiores fluctus eduntur quam Aquilone, quoniam ille infernus ex imo mari spirat, hic summo; ideoque post Austros noxii praecipue terrae motus.
129 noctu Auster, interdiu Aquilo vehementior, et ab ortu flantes diuturniores sunt ab occasu flantibus. Septentriones inpari fere[1] desinunt numero, quae observatio et in aliis multis rerum naturae partibus valet; mares itaque existimantur impares numeri sol et auget et conprimit flatus—auget exoriens occidensque, conprimit meridianus aestivis temporibus; itaque medio diei aut noctis plerumque sopiuntur, quia aut nimio frigore aut aestu solvuntur. et imbribus venti sopiuntur; exspectantur[2] autem maxime unde nubes discussae adaperuere caelum.

130 Omnium quidem (si libeat observare minimos ambitus) redire easdem vices quadriennio exacto Eudoxus putat, non ventorum modo verum et reliquarum tempestatum magna ex parte, et esse[3] principium lustri eius semper intercalario anno Caniculae ortu.

De generalibus ventis haec.

[1] fere ⟨dierum⟩? *Rackham.* [2] exspectentur? *Rackham.* [3] *Rackham*: est.

[a] I.e. East to West; the observer faces South.
[b] I.e. the wind blowing on the fourth day of the new moon usually continues all the month.

that ceases beginning. When those next to the ones falling rise, they go round from left to right[a] like the sun. The fourth moon usually decides about the course of the winds for the month.[b] Vessels by means of slacking sheets can sail in contrary directions with the same winds, so that collisions occur, usually at night, between ships on opposite tacks. The South wind causes larger waves than the North-east because the former being below blows from the bottom of the sea but the latter from the top; consequently earthquakes following South winds are specially destructive. The South wind is more violent at night and the North-east wind in the day-time; and easterly winds continue longer than westerly. North winds usually stop after blowing an odd number of days, an observation that holds good in many other departments of nature also: this is why the odd numbers are thought to be masculine. The sun both increases and reduces the force of the wind—the former when rising and setting, the latter at midday in summer seasons; consequently the winds are usually lulled at midday or midnight, because either excessive cold or excessive heat makes them slack. Also winds are lulled by rain; but they are most to be expected from quarters where the clouds have broken, revealing a clear sky.

Eudoxus however thinks that (if we choose to study the minimal circuits) there is a regular recurrence of all phenomena—not only of winds but largely of other sorts of bad weather as well—in four-yearly periods, and that the period always begins in a leap-year at the rising of Sirius.

These are our observations with regard to the winds that are regular.

131 XLIX. Nunc de repentinis flatibus, qui exhalante terra, ut dictum est, coorti rursusque deiecti in terram[1] obducta nubium cute, multiformes exsistunt. vagi quippe et ruentes torrentium modo (ut aliquis placere ostendimus) tonitrua et fulgura edunt. maiore vero inlati pondere incursuque si late siccam rupere nubem, procellam gignunt quae vocatur a Graecis ecnephias, sin vero depresso sinu artius rotati effregerunt, sine igne, hoc est sine fulmine, verticem faciunt qui typhon vocatur, id est vibratus
132 ecnephias. defert hic secum aliquid abreptum e nube calidi[2] convolvens versansque et ruinam suam illo pondere adgravans ac locum ex loco mutans rapida vertigine, praecipua navigantium pestis, non antemnas modo verum ipsa navigia contorta frangens, tenui remedio aceti in advenientem effusi, cui frigidissima est natura. idem inlisu ipso repercussus correpta secum in caelum refert sorbetque in excelsum.

133 L. Quod si maiore depressae nubis eruperit specu sed minus lato quam procella, nec sine fragore, turbinem vocant proxima quaeque prosternentem. idem ardentior accensusque dum furit, prester vocatur amburens contacta pariter et proterens. Non

[1] *Caesarius*: interim.
[2] *Detlefsen*: gelidi *aut* gelida.

[a] § 111. [b] § 112. [c] Cf. § 133.

XLIX. Now as to sudden blasts, which arise as has been said[a] from exhalations of the earth, and fall back again to the earth drawing over it an envelope of cloud; these occur in a variety of forms. The fact is that their onrush is quite irregular, like that of mountain torrents (as we have pointed out[b] is the view of certain persons), and they give forth thunder and lightning. If travelling with a heavier momentum they burst a great gap in a dry cloud, they produce a storm called by the Greeks a cloudburst; but if they break out from a downward curve of cloud[c] with a more limited rotation, they cause a whirl unaccompanied by fire—I mean by lightning—that is called a typhoon, which denotes a whirling cloudburst. This brings down with it a portion of heat torn from a cloud, which it turns and whirls round, increasing its own downward velocity by its weight, and shifting from place to place with a rapid whirl; it is specially disastrous to navigators, as it twists round and shatters not only the yards, but the vessels themselves, leaving only the slender remedy of pouring out vinegar in advance of its approach, vinegar being a very cold substance. The same whirlwind when beaten back by its very impact snatches things up and carries them back with it to the sky, sucking them high aloft. *Casual windstorms.*

L. But if it bursts out of a larger cavern of downward pressing cloud but not so wide a one as in the case of a storm, and is accompanied by a crashing noise, this is what they call a whirlwind, which overthrows everything in its neighbourhood. When the same rages hotter and with a fiery flow, it is called a *prester*, as while sweeping away the things it comes in contact with it also scorches them up. But a *Kinds of whirlwind.*

fit autem aquilonius typhon, nec nivalis aut nive iacente [1] ecnephias. quod si simul rupit nubem exarsitque et ignem habuit, non postea concepit,
134 fulmen est. distat a prestere quo flamma ab igni: hic late funditur flatu, illud conglobatur impetu. vertex autem remeando distat a turbine et quo stridor a fragore; procella latitudine ab utroque, disiecta nube verius quam rupta. fit et caligo beluae similis in [2] nube dira navigantibus. vocatur et columna, cum spissatus umor rigensque ipse se sustinet; ex eodem genere et aulon, cum veluti fistula nubes aquam trahit.

135 LI. Hieme et aestate rara fulmina contrariis de causis, quoniam hieme densatus aer nubium crassiore corio spissatur, omnisque terrarum exhalatio rigens ac gelida quicquid accipit ignei vaporis exstinguit. quae ratio inmunem Scythiam et circa rigentia a fulminum casu praestat, e diverso nimius ardor Aegyptum, siquidem calidi siccique halitus terrae raro admodum tenuisque et infirmas densantur in nubes.
136 vere autem et autumno crebriora fulmina, correptis [3] in utroque tempore aestatis hiemisque causis; qua ratione crebra in Italia, quia mobilior aer mitiore hieme et aestate nimbosa semper quodammodo vernat vel autumnat. sunt in [4] Italiae quoque partibus iis

[1] *v.l.* aut nivem iaciens (*del. ut gloss. Pintianus*).
[2] in *Mayhoff*: e aut *om. codd.*
[3] *Rackham*: corruptis.
[4] in *add. Rackham.*

typhoon does not occur with a northerly wind, nor a cloudburst with snow or when snow is lying. If it flared up as soon as it burst the cloud, and had fire in it, did not catch fire afterwards, it is a thunderbolt. It differs from a fiery pillar in the way in which a flame differs from a fire: a fiery pillar spreads out its blast widely, whereas a thunderbolt masses together its onrush. On the other hand a tornado differs from a whirlwind by returning, and as a whizz differs from a crash; a storm is different from either in its extent—it is caused by the scattering rather than the bursting of a cloud. There also occurs a darkness caused by a cloud shaped like a wild monster—this is direful to sailors. There is also what is called a column, when densified and stiffened moisture raises itself aloft; in the same class also is a waterspout, when a cloud draws up water like a pipe.

Thunderbolts, their seasons;

LI. Thunderbolts are rare in winter and in summer, from opposite causes. In winter, owing to the thicker envelope of cloud, the air is rendered extremely dense, and all the earth's exhalation being stiff and cold extinguishes whatever fiery vapour it receives. This reason renders Scythia and the frozen regions round it immune from the fall of thunderbolts, while conversely the excessive heat does the same for Egypt, inasmuch as the hot and dry exhalations from the earth condense very rarely, and only form thin and feeble clouds. But in spring and autumn thunderbolts are more frequent, their summer and winter causes being combined in each of those seasons; this explains why they are frequent in Italy, where the milder winter and stormy summer make the air more mobile, and it is always somewhat vernal or autumnal. Also in the parts of

quae a septentrione descendunt ad teporem, qualis est urbis et Campaniae tractus, iuxta hieme et aestate fulgurat, quod non in[1] alio situ evenit.[2]

137 LII. Fulminum ipsorum plura genera traduntur. quae sicca veniunt non adurunt sed dissipant, quae fumida[3] non urunt sed infuscant. tertium est quod clarum vocant, mirificae maxime naturae, quo dolia exhauriuntur intactis operimentis nulloque alio vestigio relicto, aurum et aes et argentum liquatur intus, sacculis ipsis nullo modo ambustis ac ne confuso quidem signo cerae. Marcia femina[4] princeps Romanarum icta gravida partu exanimato ipsa citra ullum aliud incommodum vixit. in Catilinariis prodigiis Pompeiano ex municipio M. Herennius decurio sereno die fulmine ictus est.

138 LIII. Tuscorum litterae novem deos emittere fulmina existimant, eaque esse undecim generum, Iovem enim trina iaculari. Romani duo tantum ex iis servavere, diurna attribuentes Iovi, nocturna Summano, rariora sane eadem de causa frigidioris caeli. Etruria erumpere terra quoque arbitratur, quae infera appellat, brumali tempore facta saeva maxime et exsecrabilia, cum sint omnia quae terrena existimant non illa generalia nec a sideribus venientia

[1] in⟨ullo⟩alio? *Rackham.*
[2] evenit *om. codd. plurimi.*
[3] fumida (ψολόεντα *Aristotle Meteorol.* 371 a 21) *Brotier*: umida.
[4] femina *add. Mayhoff.*

Italy that slope down from the north towards the warmth, such as the district of Rome and the Campagna, lightning occurs in winter just as in summer, which does not happen in any other locality.

LII. Of thunderbolts themselves several varieties are reported. Those that come with a dry flash do not cause a fire but an explosion. The smoky ones do not burn but blacken. There is a third sort, called 'bright thunderbolts,' of an extremely remarkable nature; this kind drains casks dry without damaging their lids and without leaving any other trace, and melts gold and copper and silver in their bags without singeing the bags themselves at all, and even without melting the wax seal. Marcia, a lady of high station at Rome, was struck by lightning when *enceinte*, and though the child was killed, she herself survived without being otherwise injured. Among the portents in connexion with Catiline, a town-councillor of Pompei named Marcus Herennius was struck by lightning on a fine day.

Their varieties.

LIII. The Tuscan writers hold the view that there are nine gods who send thunderbolts, and that these are of eleven kinds, because Jupiter hurls three varieties. Only two of these deities have been retained by the Romans, who attribute thunderbolts in the daytime to Jupiter and those in the night to Summanus, the latter being naturally rare because the sky at night is colder. Tuscany believes that some also burst out of the ground, which it calls 'low bolts,' and that these are rendered exceptionally direful and accursed by the season of winter, though all the bolts that they believe of earthly origin are not the ordinary ones and do not come

Views as t their cause

sed ex proxima atque turbidiore natura: argumentum evidens, quod omnia e superiore caelo decidentia obliquos habent ictus, haec autem quae vocant
139 terrena rectos. et quae[1] ex propiore materia cadunt ideo creduntur e terra exire quoniam ex repulsu nulla vestigia edunt, cum sit illa ratio non inferi ictus sed aversi.[2] a Saturni ea sidere proficisci subtilius ista consectati putant, sicut cremantia a Martis, qualiter cum Volsinii, oppidum Tuscorum opulentissimum, totum concrematum est fulmine. vocant et familiaria, in totam vitam fatidica, quae prima fiunt familiam suam cuique indepto. ceterum existimant non ultra decem annos portendere privata praeterquam aut primo matrimonio facta aut natali die, publica non ultra tricesimum annum praeterquam in deductione oppidi.

140 LIV. Exstat annalium memoria sacris quibusdam et precationibus vel cogi fulmina vel inpetrari. vetus fama Etruriae est inpetratum, Volsinios urbem depopulatis agris subeunte monstro quod vocavere Oltam, evocatum a Porsina suo rege. et ante eum a Numa saepius hoc factitatum in primo annalium suorum tradit L. Piso, gravis auctor, quod imitatum parum rite Tullum Hostilium ictum fulmine. lucos-

[1] Et quae *Mayhoff*: sed quia.
[2] *Rackham*: adversi.

[a] I.e. the air.

from the stars but from the nearer and more disordered element[a]: a clear proof of this being that all those coming from the upper heaven deliver slanting blows, whereas these which they call earthly strike straight. And those that fall from the nearer elements are supposed to come out of the earth because they leave no traces as a result of their rebound, although that is the principle not of a downward blow but of a slanting one. Those who pursue these enquiries with more subtlety think that these bolts come from the planet Saturn, just as the inflammatory ones come from Mars, as, for instance, when Bolsena, the richest town in Tuscany, was entirely burnt up by a thunderbolt. Also the first ones that occur after a man sets up house for himself are called 'family meteors,' as foretelling his fortune for the whole of his life. However, people think that private meteors, except those that occur either at a man's first marriage or on his birthday, do not prophecy beyond ten years, nor public ones beyond the 30th year, except those occurring at the colonization of a town.

Thunder- in answe prayer.

LIV. Historical record also exists of thunderbolts being either caused by or vouchsafed in answer to certain rites and prayers. There is an old story of the latter in Tuscany, when the portent which they called Olta came to the city of Bolsena, when its territory had been devastated; it was sent in answer to the prayer of its king Porsina. Also before his time, as is recorded on the reliable authority of Lucius Piso in his *Annals* I, this was frequently practised by Numa, though when Tullus Hostilius copied him with incorrect ritual he was struck by lightning. We also have groves and

que et aras et sacra habemus, interque Statores ac Tonantes et Feretrios Elicium quoque accepimus
141 Iovem. varia in hoc vitae sententia et pro cuiusque animo. imperare naturae sacra audacis est credere, nec minus hebetis beneficiis abrogare vires, quando in fulgurum quoque interpretatione eo profecit scientia ut ventura alia finito die praecinat et an peremptura sint factum[1] aut[2] prius alia facta[3] quae lateant, innumerabilibus in utroque publicis privatisque experimentis. quamobrem sint ista ut rerum naturae libuit, alias certa alias dubia, aliis probata aliis damnanda, nos cetera[4] quae sunt in his memorabilia non omittemus.

142 LV. Fulgetrum prius cerni quam tonitrum audiri, cum simul fiant, certum est (nec mirum, quoniam lux sonitu velocior); ictum autem et sonitum congruere ita modulante natura, sed sonitum profecti esse fulminis, non inlati; etiamnum spiritum ociorem fulmine, ideo quati prius omne et adflari quam percuti; nec quemquam tangi qui viderit fulmen aut tonitrum audierit. laeva prospera existimantur quo-

[1] v.l. fatum. [2] v.l. aut apertura.
[3] v.l. fata. [4] v.l. de cetero.

[a] Jupiter to whom *spolia opima* were offered in return for victory in battle.

altars and rites, and among the other Jupiters, the Stayers and Thunderers and Receivers of Offerings,[a] tradition gives us Jupiter the Invoked. On this matter the opinion of mankind varies, in correspondence with our individual dispositions. It takes a bold man to believe that Nature obeys the behests of ritual, and equally it takes a dull man to deny that ritual has beneficent powers, when knowledge has made such progress even in the interpretation of thunderbolts that it can prophecy that others will come on a fixed day, and whether they will destroy a previous one or other previous ones that are concealed: this progress has been made by public and private experiments in both fields. In consequence although such indications are certain in some cases but doubtful in others, and approved to some persons but in the view of others to be condemned, in accordance with Nature's will and pleasure, we for our part are not going to leave out the rest of the things worth recording in this department.

Thunder and lightning.

LV. It is certain that when thunder and lightning occur simultaneously, the flash is seen before the thunderclap is heard (this not being surprising, as light travels more swiftly than sound); but that Nature so regulates the stroke of a thunderbolt and the sound of the thunder that they occur together, although the sound is caused by the bolt starting, not striking; moreover that the current of air travels faster than the bolt, and that consequently the object always is shaken and feels the blast before it is struck; and that nobody hit has ever seen the lightning or heard the thunder in advance. Flashes on the left are considered lucky, because the sun

niam laeva parte mundi ortus est; nec tam adventus spectatur quam reditus, sive ab ictu resilit ignis sive opere confecto aut igne consumpto spiritus remeat.

143 In sedecim partes caelum in eo spectu divisere Tusci: prima est a septemtrionibus ad aequinoctialem exortum, secunda ad meridiem, tertia ad aequinoctialem occasum, quarta obtinet quod reliquum est ab occasu ad septemtriones; has iterum in quaternas divisere partes, ex quibus octo ab exortu sinistras, totidem e contrario appellavere dextras. ex his maxime dirae quae septemtriones ab occasu attingunt. itaque plurimum refert unde venerint fulmina et quo concesserint. optimum est in
144 exortivas redire partes. ideo cum a prima caeli parte venerint et in eandem concesserint, summa felicitas portendetur, quale Sullae dictatori ostentum datum accepimus; cetera ad ipsius mundi portionem[1] minus prospera aut dira. quidam[2] fulgura enuntiare non putant fas nec audire, praeterquam si hospiti indicentur aut parenti.

Magna huius observationis vanitas tacta Iunonis aede Romae deprehensa est Scauro consule qui mox princeps fuit.

145 Noctu magis quam interdiu sine tonitribus fulgurat. unum animal hominem non semper ex-

[1] *Mayhoff* (*cf.* xiii 133 *etc.*): cetera ipsius mundi portione.
[2] *Rackham*: quaedam.

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[a] It is assumed that an observer faces South.
[b] 115 B.C.
[c] Cf. XXXVI. 144 *princeps civitatis*.

rises on the left-hand[a] side of the firmament; and their approach is not so visible as their return, whether after the blow a fire springs from it or the breath returns when its work is done or its fire used up.

Augury by thunderbolts.

In making these observations the Tuscans divided the heaven into sixteen parts: the first quarter is from the North to the equinoctial sunrise (East), the second to the South, the third to the equinoctial sunset (West), and the fourth occupies the remaining space extending from West to North; these quarters they subdivided into four parts each, of which they called the eight starting from the East the left-hand regions and the eight opposite ones the right-hand. Of these the most formidable are those lying between West and North. Hence the line of approach and the line of retirement of thunderbolts is of very great importance. It is best for them to return to parts in the region of sunrise. Accordingly it will be a portent of supreme happiness when they come from the first part of the sky and retire to the same part—a sign that history records to have been vouchsafed to the dictator Sulla; but all the others are less fortunate or actually direful, in accordance with the division of the actual firmament where they occur. Some people think it wrong to give or to listen to reports of thunderbolts, except if they are told to a guest or a parent.

The great folly of paying attention to these occurrences was discovered when the Temple of Juno at Rome was struck by lightning in the consulship[b] of Scaurus, who was afterwards head of the state.[c]

Lightning effects of.

Lightning unaccompanied by thunder occurs more often by night than in the daytime. Man is the one

stinguit, cetera illico, hunc videlicet natura tribuente honorem cum tot beluae viribus praestent. omnia contrarias incubant in partes. homo nisi convertatur vi percussus non exspirat. superne icti considunt. vigilans ictus coniventibus oculis, dormiens patentibus reperitur. hominem ita exanimatum cremari fas non est, condi terra religio tradidit. nullum animal nisi exanimatum fulmine accenditur. volnera fulminatorum frigidiora sunt
146 reliquo corpore. LVI. ex iis quae terra gignuntur lauri fruticem non icit. nec umquam quinque altius pedibus descendit in terram; ideo pavidi altiores specus tutissimos putant, aut tabernacula pellibus beluarum quas vitulos appellant, quoniam hoc solum animal ex marinis non percutiat, sicut nec e volucribus aquilam, quae ob hoc armigera huius teli fingitur. in Italia inter Tarracinam et aedem Feroniae turres belli Caesariani[1] temporibus desiere fieri nulla non earum fulmine diruta.

147 LVII. Praeter haec in[2] inferiore caelo relatum in monumenta est lacte et sanguine pluisse M'. Acilio C. Porcio coss. et saepe alias carne sicut P. Volumnio Servio Sulpicio coss., exque ea non putruisse quod non

[1] *Detlefsen*: bellices (belli civilis *Mayhoff*).
[2] in *om. v.l.*

[a] 114 B.C. [b] 461 B.C.

creature that is not always killed when struck—all others are killed on the spot; nature doubtless bestows this honour on man because so many animals surpass him in strength. All things (when struck) fall in the opposite direction to the flash. A man does not die unless the force of the blow turns him right round. Men struck from above collapse. A man struck while awake is found with his eyes shut; while asleep, with them open. It is not lawful to cremate a man who loses his life in this manner; religious tradition prescribes burial. No living creature can be burnt by lightning without being killed. The temperature of the wound of those struck is lower than that of the rest of the body. LVI. Among things that grow in the ground, it does not strike a laurel bush. It never penetrates more than five feet into the earth; consequently when in fear of lightning men think caves of greater depth are the safest, or else a tent made of the skin of the creatures called sea-calves, because that alone among marine animals lightning does not strike, just as it does not strike the eagle among birds; this is why the eagle is represented as armed with a thunderbolt as a weapon. In Italy in the time of the Caesarian war people ceased to build towers between Terracina and the Temple of Feronia, as every tower there was destroyed by lightning.

LVII. Besides these events in the lower sky, it is entered in the records that in the consulship[a] of Manius Acilius and Gaius Porcius it rained milk and blood, and that frequently on other occasions there it has rained flesh, for instance in the consulship[b] of Publius Volumnius and Servius Sulpicius, and that none of the flesh left unplundered by birds of prey *Rain of blood, etc.*

diripuissent aves, item ferro in Lucanis anno antequam M. Crassus a Parthis interemptus est omnesque cum eo Lucani milites, quorum magnus numerus in exercitu erat: effigies quo[1] pluit ferri spongearum[2] similis fuit; haruspices praemonuerunt superna volnera. L. autem Paullo C. Marcello coss. lana pluit circa castellum Compsanum, iuxta quod post annum T. Annius Milo occisus est. eodem causam dicente lateribus coctis pluisse in acta eius anni relatum est.

148 LVIII. Armorum crepitus et tubae sonitus auditos e caelo Cimbricis bellis accepimus, crebroque et prius et postea. tertio vero consulatu Mari ab Amerinis et Tudertibus spectata arma caelestia ab ortu occasuque inter se concurrentia, pulsis quae ab occasu erant. ipsum ardere caelum minume mirum est et saepius visum maiore igne nubibus conreptis.

149 LIX. Celebrant Graeci Anaxagoran Clazomenium Olympiadis septuagesimae octavae secundo anno praedixisse caelestium litterarum[3] scientia quibus diebus saxum casurum esset e sole, idque factum interdiu in Thraciae parte ad Aegos flumen (qui lapis etiamnunc ostenditur magnitudine vehis, colore adusto) comete quoque illis noctibus flagrante. quod si quis praedictum credat, simul fateatur necesse est

[1] *Mayhoff*: que *aut* quae.
[2] *Mayhoff*: spongearum ferri *aut* spongearum.
[3] *v.l.* caelestium militiarum.

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[a] In the battle of Carrhae 53 B.C.
[b] I.e. lumps of porous stone.
[c] 49 B.C. [d] Now Conza, in Samnium.
[e] From North Germany, 113–101 B.C.
[f] 103 B.C. [g] Now Todi. [h] 467 B.C.

went bad; and similarly that it rained iron in the district of Lucania the year before Marcus Crassus was killed[a] by the Parthians and with him all the Lucanian soldiers, of whom there was a large contingent in his army; the shape of the iron that fell resembled sponges[b]; the augurs prophecied wounds from above. But in the consulship[c] of Lucius Paullus and Gaius Marcellus it rained wool in the vicinity of Compsa[d] Castle, near which Titus Annius Milo was killed a year later. It is recorded in the annals of that year that while Milo was pleading a case in court it rained baked bricks.

Armies in the sky.

LVIII. We are told that during the wars with the Cimbri[e] a noise of clanging armour and the sounding of a trumpet were heard from the sky, and that the same thing has happened frequently both before then and later. In the third consulship[f] of Marius the inhabitants of Ameria and Tuder[g] saw the spectacle of heavenly armies advancing from the East and the West to meet in battle, those from the West being routed. It has often been seen, and is not at all surprising, that the sky itself catches fire when the clouds have been set on fire by an exceptionally large flame.

Sun-stones

LIX. The Greeks tell the story that Anaxagoras of Clazomenae in the 2nd year[h] of the 78th Olympiad was enabled by his knowledge of astronomical literature to prophecy that in a certain number of days a rock would fall from the sun; and that this occurred in the daytime in the Goat's River district of Thrace (the stone is still shown—it is of the size of a wagon-load and brown in colour), a comet also blazing in the nights at the time. If anyone believes in the fact of this prophecy, that involves his allowing

maioris miraculi divinitatem Anaxagorae fuisse, solvique rerum naturae intellectum et confundi omnia si aut ipse sol lapis esse aut umquam lapidem in eo fuisse credatur. decidere tamen crebro non erit
150 dubium. in Abydi gymnasio ex ea causa colitur hodieque modicus quidem sed quem in medio terrarum casurum idem Anaxagoras praedixisse narratur. colitur et Cassandriae, quae Potidaea vocitata est, ob id deductae. ego ipse vidi in Vocontiorum agro paulo ante delapsum.[1]

LX. Arcus vocamus extra miraculum frequentes et extra ostentum; nam ne pluvios quidem aut serenos dies cum fide portendunt. manifestum est radium solis inmissum cavae nubi repulsa acie in solem refringi, colorumque varietatem mixtura nubium, ignium, aeris fieri. certe nisi sole adverso non fiunt, nec umquam nisi dimidia circuli forma, nec noctu, quamvis Aristoteles prodat aliquando visum, quod tamen fatetur idem non nisi quartadecima[2]
151 luna fieri posse. fiunt autem hieme maxime ab aequinoctio autumnali die decrescente; quo rursus crescente ab aequinoctio verno non exsistunt, nec circa solstitium longissimis diebus, bruma vero [id est brevissimis[3]] frequenter; iidem sublimes humili

[1] *Rackham*: delatum.
[2] *edd.* (= XIV): tricesima (= XXX).
[3] *Seclusit Mayhoff.*

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[a] 'Potidaea' from ποτί = πρός and δαίομαι 'to burn' (Brotier)
[b] The MSS. give 'brought in' (from the country).
[c] Aristotle, *Meteorologica*, III, ii, 372a, 27 ἐν τῇ πανσελήνῳ (meaning any time when the moon is more than at half).
[d] The omitted clause 'that is, at the shortest days' looks like a philological note on 'bruma.'

that the divining powers of Anaxagoras covered a greater marvel, and that our understanding of the physical universe is annihilated and everything thrown into confusion if it is believed either that the sun is itself a stone or ever had a stone inside it. But it will not be doubted that stones do frequently fall. A stone is worshipped for this reason even at the present day in the exercising ground at Abydos—one of moderate size, it is true, but which the same Anaxagoras is said to have prophesied as going to fall in the middle of the country. There is also one that is worshipped at Cassandria, the place that has been given the name of Potidaea,[a] and where a colony was settled on account of this occurrence. I myself saw one that had recently come down[b] in the territory of the Vocontii.

Rainbows.

LX. The common occurrences that we call rainbows have nothing miraculous or portentous about them, for they do not reliably portend even rain or fine weather. The obvious explanation of them is that a ray of the sun striking a hollow cloud has its point repelled and is reflected back to the sun, and that the diversified colouring is due to the mixture of clouds, fires and air. Rainbows certainly do not occur except opposite to the sun, and never except in semi-circular shape, and not at night time, although Aristotle does state that a rainbow has been sometimes seen at night, though he also admits that it cannot happen except on the 14th day of the lunar month.[c] Rainbows in winter occur chiefly when the day is drawing in after the autumnal equinox; when the day draws out again after the vernal equinox they do not occur, nor in the longest days about the solstice, but they occur frequently in midwinter[d]; also they are high

sole humilesque sublimi, et minores oriente aut occidente sed in latitudinem demissi, meridie exiles verum ambitus maioris. aestate autem per meridiem non cernuntur post autumni aequinoctium quacumque hora; nec umquam plures simul quam duo.

152 LXI. Cetera eiusdem naturae non multis dubia esse video: grandinem conglaciato imbre gigni et nivem eodem umore mollius coacto, pruinam autem ex rore gelido; per hiemem nives cadere, non grandines, ipsasque grandines interdiu saepius quam noctu, et multo celerius resolvi quam nives; nebulas nec aestate nec maximo frigore exsistere, rores neque gelu neque ardoribus neque ventis nec nisi serena nocte; gelando liquorem minui, resolutaque glacie non eundem inveniri modum; varietates colorum figurarumque in nubibus cerni prout admixtus ignis superet aut
153 vincatur; LXII. praeterea quasdam proprietates quibusdam locis esse, roscidas aestate Africae noctes, in Italia Locris et in lacu Velino nullo non die adparere arcus, Rhodi et Syracusis numquam tanta nubila obduci ut non aliqua hora sol cernatur; qualia aptius suis referentur locis.

Haec sint dicta de aere.

154 LXIII. Sequitur terra, cui uni rerum naturae partium eximia propter merita cognomen indidimus maternae venerationis. sic hominum illa ut caelum dei, quae nos nascentes excipit, natos alit, semelque

[a] That is, the water is of larger bulk than the ice was. In fact of course the opposite is true.

in the sky when the sun is low and low when it is high; and smaller but of wider breadth at sunrise or sunset, and narrow but of large circumference at midday. In summer they are not seen during midday, but after the autumn equinox they are seen at any hour; and never more than two are seen at once.

Hail, snow frost, rainbows.

LXI. I observe that the facts as to the other phenomena of the same kind are generally familiar: viz. that hail is produced from frozen rain and snow from the same fluid less solidly condensed, but hoar frost from cold dew; that snow falls during winter but not hail, and hail itself falls more often in the daytime than at night, and melts much faster than snow; that mists do not occur in summer nor in extremely cold weather, nor dew in frosty or very hot or windy weather, and only on fine nights; that liquid is reduced in bulk by freezing, and when ice is thawed the bulk produced is not the same [a]; that variations of colour and shape are seen in the clouds in proportion as the fire mingled with them gains the upper hand or is defeated; LXII. and moreover that particular places have particular special qualities: the nights of Africa are dewy in summer, in Italy rainbows are seen every day at Locri and at the Veline Lake, at Rhodes and Syracuse there is never such a thick curtain of cloud that the sun is not visible at some hour of the day. Such special features will be more suitably related in their places.

So much on the subject of the air.

Mother Earth.

LXIII. Next comes the earth, the one division of the natural world on which for its merits we have bestowed the venerable title of mother. She belongs to men as the sky belongs to God: she receives us at birth, and gives us nurture after birth, and when once

editos sustinet semper, novissime conplexa gremio iam a reliqua natura abdicatos tum maxime ut mater operiens, nullo magis sacra merito quam quo nos quoque sacros facit, etiam monimenta ac titulos gerens nomenque prorogans nostrum et memoriam extendens contra[1] brevitatem aevi, cuius numen ultimum iam nullis precamur irati grave, tamquam nesciamus hanc esse solam quae numquam irascatur
155 homini. aquae subeunt in imbres, rigescunt in grandines, tumescunt in fluctus, praecipitantur in torrentes; aer densatur nubibus, furit procellis; at haec benigna, mitis, indulgens, ususque mortalium semper ancilla, quae coacta generat, quae sponte fundit, quos odores saporesque, quos sucos, quos tactus, quos colores! quam bona fide creditum faenus[2] reddit! quae nostra causa alit! pestifera enim animantia, vitali spiritu habente culpam, illi necesse est seminata excipere et genita sustinere, sed in malis generantium noxa est. illa serpentem homine percusso amplius non recipit, poenasque etiam inertium nomine exigit; illa medicas fundit herbas,
156 et semper homini parturit; quin et venena nostri miseritam instituisse credi potest, ne in taedio vitae fames, mors terrae meritis alienissima, lenta nos consumeret tabe, ne lacerum corpus abrupta dis-

[1] ultra *Haupt.* [2] faenus *v.l. om.*

[a] 'Sit tibi terra gravis.' 'Sit tibi terra levis' was common on gravestones.

[b] This oddly inaccurate phrase occurs at V. 24, and in Plautus and Cicero.

[c] Cf. infra 158 fin.

[d] Cf. XXIX 74.

brought forth she upholds us always, and at the last when we have now been disinherited by the rest of nature she embraces us in her bosom and at that very time gives us her maternal shelter; sanctified by no service more than that whereby she makes us also sacred, even bearing our monuments and epitaphs and prolonging our name and extending our memory against the shortness of time; whose divinity is the last which in anger we invoke to lie heavy[a] on those who are now no more, as though we did not know that she is the only element that is never wroth with man. Water rises in mist, freezes into hail, swells in waves, falls headlong in torrents; air becomes thick with clouds and rages with storms; but earth is kind and gentle and indulgent, ever a handmaid in the service of mortals, producing under our compulsion, or lavishing of her own accord, what scents and savours, what juices, what surfaces for the touch, what colours! how honestly she repays the interest lent her![b] what produce she fosters for *Earth's bounty.* our benefit! since for living creatures that are noxious the breath of life is to blame—she is compelled to receive them when their seed is sown and to maintain them when they have been born; but their harm lies in the evils of those that generate them.[c] When a serpent has stung a man she harbours it no more,[d] and she exacts retribution even on the account of the helpless; she produces medicinal herbs, and is ever fertile for man's benefit; nay, even poisons she may be thought to have invented out of compassion for us, lest, when we were weary of life, hunger, the death most alien to earth's beneficence, should consume us with slow decay, lest precipices should scatter in fragments our lacerated body, lest

pergerent, ne laquei torqueret poena praepostera incluso spiritu cui quaereretur exitus, ne in profundo quaesita morte sepultura pabulo fieret, ne ferri cruciatus scinderet corpus. ita est, miserita genuit id cuius facillimo haustu inlibato corpore et cum toto sanguine exstingueremur nullo labore, sitientibus similes, qualiter defunctos non volucris, non ferae attingerent, terraeque servaretur qui sibi ipsi
157 periisset. verum fateamur: terra nobis malorum remedium genuit, nos illud vitae fecimus venenum; non enim et ferro, quo carere non possumus, simili modo utimur? nec tamen quereremur merito etiamsi malefici causa tulisset. adversus unam quippe naturae partem ingrati sumus. quas non ad delicias quasque non ad contumelias servit homini? in maria iacitur, aut ut freta admittamus eroditur, aquis, ferro, ligno, igni, lapide, fruge omnibus cruciatur horis, multoque plus ut deliciis quam ut alimen-
158 tis famuletur nostris. ut[1] tamen quae summa patitur atque extrema cute tolerabilia videantur, penetramus in viscera auri argentique venas et aeris ac plumbi metalla fodientes, gemmas etiam et quosdam parvolos quaerimus lapides scrobibus in profundum actis, viscera eius extrahimus, ut digito gestetur gemma petitur. quot manus atteruntur ut unus niteat articulus! si ulli essent inferi, iam pro-

[1] *Sillig*: et.

[a] Or 'should be effected by our becoming food,' *sc.* for fishes.

we should be tortured by the perverted punishment of the noose which imprisons the breath whose departure it is seeking; lest if we sought death in the deep our burial should serve for fodder[a]; lest the torture of the steel should cleave our body. So is it! in mercy did she generate the potion whereof the easiest draught—as men drink when thirsty—might painlessly just blot us out, without injury to the body or loss of blood, in such wise that when dead no birds nor beasts should touch us, and one that had perished for himself should be preserved for the earth. Let us own the truth: what earth has produced as a cure for our ills, we have made into a deadly poison; why, do we not also put her indispensable gift of iron to a similar use? Nor yet should we have any right to complain even if she had engendered poison to serve the purpose of crime. In fact in regard to one of nature's elements we have no gratitude. For what luxuries and for what outrageous uses does she not subserve mankind? She is flung into the sea, or dug away to allow us to let in the channels. Water, iron, wood, fire, stone, growing crops, are employed to torture her at all hours, and much more to make her minister to our luxuries than our sustenance. Yet in order to make the sufferings inflicted on her surface and mere outer skin seem endurable, we probe her entrails, digging into her veins of gold and silver and mines of copper and lead; we actually drive shafts down into the depth to search for gems and certain tiny stones; we drag out her entrails, we seek a jewel merely to be worn upon a finger! How many hands are worn away with toil that a single knuckle may shine resplendent! If any beings of the nether world

Man's abuse of her gifts.

fecto illos avaritiae atque luxuriae cuniculi refodissent! et miramur si eadem ad noxam genuit aliqua?
159 ferae enim, credo, custodiunt illam arcentque sacrilegas manus; nonne[1] inter serpentes fodimus et venas auri tractamus cum veneni radicibus? placatiore tamen dea utimur ob hoc, quod omnes hi opulentiae exitus ad scelera caedesque et bella tendunt, quamque sanguine nostro rigamus insepultis ossibus tegimus, quibus tamen velut expurgato[2] furore tandem ipsa se obducit et scelera quoque mortalium occultat.

Inter crimina ingrati animi et hoc duxerim quod
160 naturam eius ignoramus. LXIV. est autem figura prima de qua consensus iudicat. orbem certe dicimus terrae, globumque verticibus includi fatemur. neque enim absoluti orbis est forma in tanta montium excelsitate, tanta camporum planitie, sed cuius amplexus, si capita cunctarum[3] liniarum conprehendantur ambitu, figuram absoluti orbis efficiat—id quod ipsa rerum natura cogit, non eisdem causis quas attulimus in caelo. namque in illo cava in se convexitas vergit et cardini suo, hoc est terrae, undique incumbit, haec ut solida ac conferta adsurgit intumescenti similis extraque protenditur. mundus in centrum vergit, at terra exit a centro, inmensum

[1] *v.l.* non. [2] *Rackham*: exprobrato.
[3] *Ignotus apud Dalecampium*: si cuncta *aut* si capita.

[a] I.e. imaginary radii drawn from the centre to the topmost point of each protuberance on the earth's surface.

existed, assuredly even they would have been dug up ere now by the burrowings of avarice and luxury! And can we wonder if earth has also generated some creatures for our harm? since the wild animals, I well believe, are her guardians, and protect her from sacrilegious hands; do not serpents infest our mines, do we not handle veins of gold mingled with the roots of poison? Yet that shows the goddess all the kinder towards us, because all these avenues from which wealth issues lead but to crime and slaughter and warfare, and her whom we besprinkle with our blood we cover with unburied bones, over which nevertheless, when at length our madness has been finally discharged, she draws herself as a veil, and hides even the crimes of mortals.

I would reckon this too among the crimes of our ingratitude, that we are ignorant of her nature. LXIV. But her shape is the first fact about which men's judgement agrees. We do undoubtedly speak of the earth's sphere, and admit that the globe is shut in between poles. Nor yet in fact do all these lofty mountains and widely spreading plains comprise the outline of a perfect sphere, but a figure whose circuit would produce a perfect sphere if the ends of all the lines[a] were enclosed in a circumference. This is the consequence of the very nature of things, it is not due to the same causes as those we have adduced in the case of the heaven; for in the heaven the convex hollow converges on itself and from all sides rests upon its pivot, the earth, whereas the earth being a solid dense mass rises like an object swelling, and expands outward. The world converges to its centre, whereas the earth radiates outward from its centre, the ceaseless revolution of the world around

The earth's conformation.

eius globum in formam orbis adsidua circa eam mundi volubilitate cogente.

161 LXV. Ingens hic pugna litterarum [1] contraque volgi: circumfundi terrae undique homines conversisque inter se pedibus stare, et cunctis similem esse caeli verticem,[2] simili modo ex quacumque parte mediam [3] terram [4] calcari, illo quaerente, cur non decidant contra siti, tamquam non ratio praesto sit ut nos non decidere mirentur illi. intervenit sententia quamvis indocili probabilis turbae, inaequali globo, ut si sit figura pineae nucis, nihilominus terram
162 undique incoli. Sed quid hoc refert alio miraculo exoriente, pendere ipsam ac non cadere nobiscum?—ceu spiritus vis, mundo praesertim inclusi, dubia sit, aut possit cadere natura repugnante et quo cadat negante! nam sicut ignium sedes non est nisi in ignibus, aquarum nisi in aquis, spiritus nisi in spiritu, sic terrae arcentibus cunctis nisi in se locus non est. globum tamen effici mirum est in tanta planitie maris camporumque. cui sententiae adest Dicaearchus, vir in primis eruditus, regum cura permensus montes, ex quibus altissimum prodidit Pelium MCCL passuum ratione perpendiculi, nullam esse eam portionem

[1] litteratorum? *Rackham.*
[2] *v.ll.* verticem caeli *aut* verticem.
[3] *v.l.* media. [4] terram *add. Rackham.*

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[a] *Passus* = 2 *gradus* = 5 Roman feet, 1·617 yards, making Pelion's height as stated here over 6,000 English feet. The *Encyclopaedia Britannica* gives it as 5,340 feet. Pliny overstates the Alpine heights fantastically.

her forcing her immense globe into the shape of a sphere.

LXV. Here there is a mighty battle between learning on one side and the common herd on the other: the theory being that human beings are distributed all round the earth and stand with their feet pointing towards each other, and that the top of the sky is alike for them all and the earth trodden under foot at the centre in the same way from any direction, while ordinary people enquire why the persons on the opposite side don't fall off—just as if it were not reasonable that the people on the other side wonder that we do not fall off. There is an intermediate theory that is acceptable even to the unlearned crowd—that the earth is of the shape of an irregular globe, resembling a pine cone, yet nevertheless is inhabited all round. But what is the good of this theory when there arises another marvel, that the earth herself hangs suspended and does not fall and carry us with it? As if forsooth there were any doubt about the force of breath, especially when shut up inside the world, or as if it were possible for the earth to fall when nature opposes, and denies it any place to fall to! For just as the sole abode of fires is in the element of fire, and of waters in water, and of breath in breath, so earth, barred out by all the other elements, has no place except in itself. Yet it is surprising that with this vast level expanse of sea and plains the resulting formation is a globe. This view has the support of Dicaearchus, a *savant* of the first rank, who with the support of royal patrons took the measurement of mountains, and published that the highest of them was Pelion, with an altitude of 1250 paces,[a] inferring that this was no portion

Earth spherical.

universae rotunditatis colligens. mihi incerta haec videtur coniectatio, haud ignaro quosdam Alpium vertices longo tractu nec breviore quinquaginta milibus passuum adsurgere.

163 Sed volgo maxima haec pugna est, si coactam in verticem aquarum quoque figuram credere cogatur. atqui non aliud in rerum natura adspectu manifestius. namque et dependentes ubique guttae parvis globantur orbibus et pulveri inlatae frondiumque lanugini inpositae absoluta rotunditate cernuntur, et in poculis repletis media maxime tument, quae propter subtilitatem umoris mollitiamque in se residentem ratione facilius quam visu deprehenduntur; idque etiam magis mirum, in poculis repletis addito umore minimo circumfluere quod supersit, contra evenire ponderibus additis ad vicenos saepe denarios, scilicet quia intus recepta liquorem in verticem attollant, at cumulo eminenti infusa

164 delabantur. eadem est causa propter quam e navibus terra non cernatur e navium malis conspicua, ac procul recedente navigio, si quid quod fulgeat religetur in mali cacumine, paulatim descendere videatur et postremo occultetur. denique oceanus, quem fatemur ultimum, quanam alia figura cohaereret atque non decideret nullo ultra margine includente? id ipsum ad miraculum redit, quonam modo, etiamsi

[a] I.e. a negligible fraction of the earth's diameter, a negligible protrusion.

of the earth's general sphericity.[a] To me this seems a questionable guess, as I know that some peaks of the Alps rise to a great height, not less than 50,000 paces.

Spherical surface of the oceans.

But what the crowd most debates is if it must believe that the conformation of the waters also rises in a curve. Nevertheless nothing else in the natural world is more visibly manifest. For (1) hanging drops of liquid always take the shape of small round globes; (2) when dropped on dust or placed on the downy surface of leaves they are seen to be absolutely spherical; (3) in goblets when filled the surface curves upward most at the centre, though owing to the transparency of the liquid and its fluidity tending to find its own level this is more easily discovered by theory than by observation; and (4) a still more remarkable fact is that when a very little additional liquid is poured into a cup that has already been filled the surplus overflows, but the opposite happens when weighty solids, often as many as 20 coins, are put into it, presumably because these pass inside the liquid and raise its surface to a peak, whereas liquids poured on to the upward curving surface slip off. (5) The same cause explains why the land is not visible from the deck of a ship when in sight from the masthead; and why as a vessel passes far into the distance, if some shining object is tied to the top of the mast it appears slowly to sink and finally it is hidden from sight. Lastly (6) what other conformation could have caused the ocean, which we acknowledge to be at the extreme outside, to cohere and not fall away, if there is no boundary beyond to enclose it? The very question as to how, although the sea is globular in shape, its edge does

globetur, extremum non decidat mare. contra quod, ut sint plana maria et qua videntur figura, non posse id accidere magno suo gaudio magnaque gloria inventores Graeci subtilitate geometrica docent.
165 namque cum e sublimi in inferiora aquae ferantur et sit haec natura earum confessa, nec quisquam dubitet in litore ullo accessisse eas quo longissime devexitas passa sit, procul dubio adparere quo quid humilius sit propius a centro esse terrae, omnesque linias quae emittantur ex eo ad proximas aquas breviores fieri quam quae ad extremum mare a primis aquis; ergo totas omnique ex parte aquas vergere in centrum, ideoque non decidere quoniam in interiora nitantur.

166 LXVI. Quod ita formasse artifex naturae[1] credi debet, ut, cum terra arida et sicca constare per se ac sine umore non posset, nec rursus stare aqua nisi sustinente terra, mutuo inplexu iungerentur, hac sinus pandente, illa vero permeante totam intra extra infra[2] supra venis ut vinculis discurrentibus, atque etiam in summis iugis erumpente, quo spiritu acta et terrae pondere expressa siphonum modo emicat, tantumque a periculo decidendi abest ut in summa quaeque et altissima exsiliat. qua ratione mani-

[1] *v.l.* natura. [2] infra *add. edd.*

not fall away, itself ranks with the marvellous. On the other side the Greek investigators, greatly to their delight and to their glory, prove by subtle mathematical reasoning that it cannot possibly be the case that the seas are really flat and have the shape that they appear to have. For, they argue, while it is the case that water travels downward from an elevation, and this is its admitted nature, and nobody doubts that the water on any coast has reached the farthest point allowed by the slope of the earth, it is manifest beyond doubt that the lower an object is the nearer it is to the centre of the earth, and that all the lines drawn from the centre to the nearest bodies of water are shorter than those drawn from the edge of these waters to the farthest point in the sea: it therefore follows that all the water from every direction converges towards the centre, this pressure inward being the cause of its not falling off.

Coherence of earth and water.

LXVI. The reason for this formation must be thought to be the inability of earth when absolutely dry to cohere of itself and without moisture, and of water in its turn to remain still without being held up by earth; the intention of the Artificer of nature must have been to unite earth and water in a mutual embrace, earth opening her bosom and water penetrating her entire frame by means of a network of veins radiating within and without, above and below, the water bursting out even at the tops of mountain ridges, to which it is driven and squeezed out by the weight of the earth, and spurts out like a jet of water from a pipe, and is so far from being in danger of falling down that it leaps upward to all the loftiest elevations. This theory shows clearly why the seas

festum est quare tot fluminum cotidiano accessu maria non crescant. est igitur in toto suo globo tellus medio ambitu praecincta circumfluo mari, nec argumentis hoc investigandum, sed iam experimentis cognitum.

167 LXVII. A Gadibus columnisque Herculis Hispaniae et Galliarum circuitu totus hodie navigatur occidens. septentrionalis vero oceanus maiore ex parte navigatus est auspiciis divi Augusti Germaniam classe circumvecta ad Cimbrorum promunturium et inde inmenso mari prospecto aut fama cognito Scythicam ad plagam et umore nimio rigentia. propter quod minime verisimile est illic maria deficere ubi umoris vis superet. iuxta vero ab ortu ex Indico mari sub eodem sidere pars tota vergens in Caspium mare pernavigata est Macedonum armis Seleuco atque Antiocho regnantibus, qui et Seleucida et Antiochida
168 ab ipsis appellari voluere. et circa Caspium multa oceani litora explorata parvoque brevius quam totus hinc aut illinc septentrio eremigatus, ut iam[1] coniecturae locum sic quoque non relinquat ingens argumentum paludis Maeoticae, sive ea illius oceani sinus est, ut multos adverto credidisse, sive angusto discreti situ restagnatio. alio latere Gadium ab eodem occidente magna pars meridiani sinus ambitu Mauretaniae

[1] *Mayhoff*: tamen.

[a] Cape Skagen, Jutland.
[b] The Caspian Sea was believed to have an outlet by a Strait into the Outer Ocean, which was thought to flow not far north of the Himalayas and South Russia.

do not increase in bulk with the daily accession of so many rivers. The consequence is that the earth at every point of its globe is encircled and engirdled by sea flowing round it, and this does not need theoretical investigation, but has already been ascertained by experience.

Circumnavigation of the earth.

LXVII. Today the whole of the West is navigated from Cadiz and the Straits of Gibraltar all round Spain and France. But the larger part of the Northern Ocean was explored under the patronage of his late Majesty Augustus, when a fleet sailed round Germany to the promontory of the Cimbri,[a] and thence seeing a vast sea in front of them or learning of it by report, reached the region of Scythia and localities numb with excessive moisture. On this account it is extremely improbable that there is no sea in those parts, as there is a superabundance of the moist element there. But next, on the Eastward side, the whole quarter under the same star stretching from the Indian Ocean to the Caspian Sea[b] was navigated throughout by the Macedonian forces in the reigns of Seleucus and Antiochus, who desired that it should be called both Seleucis and Antiochis after themselves. And many coasts of Ocean round the Caspian have been explored, and very nearly the whole of the North has been completely traversed from one side to the other by galleys, so that similarly also there is now overhwelming proof, leaving no room for conjecture, of the existence of the Maeotic Marsh, whether it be a gulf of that Ocean, as I notice many have believed, or an overflow from it from which it is separated off by a narrow space. On the other side of Cadiz, from the same Western point, a great part of the Southern gulf is navigated today in the

navigatur hodie. maiorem quidem eius partem et orientis victoriae magni Alexandri lustravere usque in Arabicum sinum, in quo res gerente C. Caesare Augusti filio signa navium ex Hispaniensibus nau-
169 fragiis feruntur agnita. et Hanno Carthaginis potentia florente circumvectus a Gadibus ad finem Arabiae navigationem eam prodidit scripto, sicut ad extera Europae noscenda missus eodem tempore Himilco. praeterea Nepos Cornelius auctor est Eudoxum quendam sua aetate, cum Lathyrum regem fugeret, Arabico sinu egressum Gades usque pervectum; multoque ante eum Caelius Antipater vidisse se qui navigasset ex Hispania in Aethiopiam
170 conmerci gratia. idem Nepos de septentrionali circuitu tradit Quinto Metello Celeri, Afrani in consulatu collegae sed tum Galliae proconsuli, Indos a rege Sueborum dono datos, qui ex India conmerci causa navigantes tempestatibus essent in Germaniam abrepti. sic maria circumfusa undique dividuo globo partem orbis auferunt nobis nec inde huc nec hinc illo pervio tractu. quae contemplatio apta detegendae mortalium vanitati poscere videtur ut totum hoc quicquid est in quo singulis nihil satis est ceu subiectum oculis quantum sit ostendam.

171 LXVIII. Iam primum in dimidio conputari videtur, tamquam nulla portio ipsi decidatur [1] oceano, qui toti [2] circumdatus medio et omnis ceteras fundens

[1] *v.ll.* decidat, decedat. [2] *Rackham*: toto.

[a] The son of Agrippa, adopted by Augustus.
[b] Both these statements are of course untrue.
[c] We know from Strabo that this statement about Eudoxus is erroneous. [d] I.e. round S. Africa.
[e] I.e. dividing us from another land-mass (now known as North and South America) which was assumed to exist on the other side of the world.

circuit of Mauretania. Indeed the greater part of it Alexander the Great's eastern conquests also explored as far as the Arabian gulf; in which, when Augustus's son Gaius Caesar [a] was operating there, it is said that figureheads of ships from Spanish wrecks were identified. Also when the power of Carthage flourished, Hanno sailed round from Cadiz to the extremity of Arabia,[b] and published a memoir of his voyage, as did Himilco when despatched at the same date to explore the outer coasts of Europe. Moreover we have it on the authority of Cornelius Nepos that a certain contemporary of his named Eudoxus when flying from King Lathyrus emerged from the Arabian Gulf and sailed right round to Cadiz [c]; and much before him Caelius Antipater states that he had seen someone who had gone on a trading voyage from Spain to Ethiopia.[d] Nepos also records as to the northern circuit that Quintus Metellus Celer, colleague of Afranius in the consulship but at the time pro-consul of Gaul, received from the King of the Swabians a present of some Indians, who on a trade voyage had been carried off their course by storms to Germany. Thus there are seas encircling the globe on every side and dividing it in two, so robbing us of half the world,[e] since there is no region affording a passage from there to here or from here to there. This reflexion serves to expose the vanity of mortals, and appears to demand that I should display to the eye and exhibit the extent of this whole indefinite region in which men severally find no satisfaction.

Portion of the earth habitable by man.

LXVIII. In the first place it is apparently reckoned as forming one half of the globe—just as if no part were cut off for the ocean itself, which surrounding and encircling the whole of it, and pouring

recipiensque aquas, et quicquid exit in nubes ac sidera ipsa tot ac tantae magnitudinis pascens, quo tandem amplitudinis spatio credetur habitare? inproba et
172 infinita debet esse tam vastae molis possessio. adde quod ex relicto plus abstulit caelum. nam cum sint eius quinque partes, quas vocant zonas, infesto rigore et aeterno gelu premitur omne quicquid est subiectum duabus extremis utrimque circa vertices, hunc qui trionum septem vocatur eumque qui adversus illi austrinus appellatur. perpetua caligo utrobique et alieno molliorum siderum adspectu maligna ac pruina tantum albicans lux. media vero terrarum, qua solis orbita est, exusta flammis et cremata comminus vapore torretur. circa duae tantum inter exustam et rigentes temperantur, eaeque ipsae inter se non perviae propter incendium sideris.

173 Ita terrae tres partes abstulit caelum. oceani rapina in incerto est; sed et relicta nobis una portio haud scio an etiam in maiore damno sit, idem siquidem oceanus infusus in multos, ut dicemus, sinus adeo vicino accessu interna maria adlatrat ut centum quindecim milibus passuum Arabicus sinus distet ab Aegyptio mari, Caspius vero CCCLXXV milibus a Pontico, idem interfusus intra per tot maria quibus Africam Europam Asiam dispescit, quantum terrarum occup-
174 at? Conputetur etiamnum[1] mensura tot flumi-

[1] *Mayhoff*: etiam nunc.

[a] I.e. especially the sun. [b] Books III foll.
[c] Cf. § 167 note.

forth and reabsorbing the waters and pasturing and all the moisture that goes to form the clouds, the stars themselves with all their numbers and their mighty size, can be supposed to occupy a space—of what extent, pray? The freehold owned by that mighty mass is bound to be enormous—without limit! Add that of what is left more than half is taken by the sky. For this has five divisions called zones, and all that lies beneath the two outermost zones that surround the poles at either end—both the pole named from the Seven Oxen and the one opposite to it called after Auster—is all crushed under cruel frost and everlasting cold. In both regions perpetual mist prevails, and a light that the invisibility of the milder stars[a] renders niggardly and that is only white with hoarfrost. But the middle portion of the lands, where the sun's orbit is, is scorched by its flames and burnt up by the proximity of its heat: this is the torrid zone. There are only two temperate zones between the torrid one and the frozen ones, and these have no communication with each other because of the fiery heat of the heavenly body.

Climatic limits.

Thus the sky has stolen three quarters of the earth. The extent of the trespass of ocean is unascertained; but even the one portion left to us suffers perhaps an even greater loss, inasmuch as the same ocean, spreading out, as we shall describe[b], into a number of bays, advances with its threatening roar so close to the inner seas that there is only a distance of 115 miles between the Arabian Gulf and the Egyptian Sea and of 375 between the Caspian and the Black Sea[c]; and also with its inner channels through so many seas whereby it sunders Africa, Europe and Asia, it occupies—what area of the land? Calculate more-

Encroachment of water.

num, tantarum paludium, addantur et lacus, stagna, iam elata in caelum ac ardua adspectu quoque iuga, iam silvae vallesque praeruptae et solitudines et mille e[1] causis deserta; detrahantur hae tot portiones terrae, immo vero, ut plures tradidere, mundi puncto (neque enim aliud est terra in universo): haec est materia gloriae nostrae, haec sedes, hic honores gerimus, hic exercemus imperia, hic opes cupimus, hic tumultuamur humanum genus, hic instauramus bella etiam civilia mutuisque caedibus
175 laxiorem facimus terram! et ut publicos gentium furores transeam, haec in qua conterminos pellimus furtoque vicini caespitem nostro solo adfodimus, ut qui latissime rura metatus fuerit ultraque famam exegerit adcolas quota terrarum parte gaudeat, vel cum ad mensuram avaritiae suae propagaverit, quam tandem portionem eius defunctus obtineat!

176 LXIX. Mediam esse terram mundi totius haut dubiis constat argumentis, sed clarissimo aequinocti paribus horis. nam nisi in medio esset, aequales dies noctesque habere non posse deprehendere est,[2] dioptraeque vel maxime confirmant, cum aequinoctiali tempore ex eadem linea ortus occasusque cernatur, solstitiali exortus per suam lineam, brumali

[1] e *add. Rackham.* [2] est *Mayhoff*: et.

[a] The Romans divided the periods from sunrise to sunset and from sunset to sunrise each into twelve hours, varying in length with the seasons.

over the dimensions of all those rivers and vast swamps, add also the lakes and pools, and next the ridges too that rise into the heaven and are precipitous even to the eye, next the forests and steep glens, and the deserts and areas for a thousand reasons left deserted; subtract all these portions from the earth or rather from this pin-prick, as the majority of thinkers have taught, in the world—for in the whole universe the earth is nothing else: and this is the substance of our glory, this is its habitation, here it is that we fill positions of power and covet wealth, and throw mankind into an uproar, and launch even civil wars and slaughter one another to make the land more spacious! And to pass over the collective insanities of the nations, this is the land in which we expel the tenants next to us and add a spade-full of turf to our own estate by stealing from our neighbour's—to the end that he who has marked out his acres most widely and banished his neighbours beyond all record may rejoice in owning—how small a fraction of the earth's surface? or, when he has stretched his boundaries to the full measure of his avarice, may still retain—what portion, pray, of his estate when he is dead?

Geocentric theory.

LXIX. That the earth is at the centre of the universe is proved by irrefragable arguments, but the clearest is the equal hours of day and night[a] at the equinox. For if the earth were not at the centre, it can be realized that it could not have the days and nights equal; and binoculars confirm this very powerfully, since at the season of the equinox sunrise and sunset are seen on the same line, whereas sunrise at midsummer and sunset at midwinter fall

occasus. quae accidere nullo modo possent nisi in centro sita esset.[1]

177 LXX. Tres autem circuli supra dictis zonis inplexi inaequalitates temporum distingunt, solstitialis a parte signiferi excelsissima nobis ad septentrionalem plagam versus, contraque ad alium polum brumalis, item medio ambitu signiferi orbis incedens aequinoctialis.

LXXI. Reliquorum quae miramur causa in ipsius terrae figura est, quam globo similem esse [2] et cum ea aquas iisdem intellegitur argumentis. sic enim fit haut dubie ut nobis septentrionalis plagae sidera numquam occidant, contra meridianae numquam oriantur, rursusque haec illis non cernantur attollente

178 se contra medios visus terrarum globo. Septentriones non cernit Trogodytice et confinis Aegyptus, nec Canopum Italia et quem vocant Berenices Crinem item quem sub divo Augusto cognominavere Caesaris Thronon, insignes ibi stellas. adeoque manifesto adsurgens fastigium curvatur ut Canopus quartam fere partem signi unius supra terram eminere Alexandriae intuentibus videatur, eadem a Rhodo terram quodammodo ipsam stringere, in Ponto omnino non cernatur, ubi maxime sublimis Septentrio. idem a Rhodo absconditur, magisque Alexandriae, in Arabia Novembri mense prima vigilia occultus secunda se

[1] *v.l. om.* esset. [2] esse *add. Rackham.*

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[a] Roughly Abyssinia and Somaliland.

on a line of their own. These things could not occur without the earth's being situated at the centre.

The seasons.

LXX. But the three circles intertwined between the zones aforesaid are the cause of the differences of the seasons: the Tropic of Cancer on the side of the highest part of the zodiac to the northward of us, and opposite to it the Tropic of Capricorn towards the other pole, and also the equator that runs in the middle circuit of the zodiac.

Geography and astronomy.

LXXI. The cause of the remaining facts that surprise us is found in the shape of the earth itself, which together with the waters also the same arguments prove to resemble a globe. For this is undoubtedly the cause why for us the stars of the northern region never set and their opposites of the southern region never rise, while on the contrary these northern stars are not visible to the antipodes, as the curve of the earth's globe bars our view of the tracts between. Cave-dweller Country [a] and Egypt which is adjacent to it do not see the Great and Little Bear, and Italy does not see Canopus and the constellation called Berenice's Hair, also the one that in the reign of his late Majesty Augustus received the name of Caesar's Throne, constellations that are conspicuous there. And so clearly does the rising vault curve over that to observers at Alexandria Canopus appears to be elevated nearly a quarter of one sign above the earth, whereas from Rhodes it seems practically to graze the earth itself, and on the Black Sea, where the North Stars are at their highest, it is not visible at all. Also Canopus is hidden from Rhodes, and still more from Alexandria; in Arabia in November it is hidden during the first quarter of the

ostendit, in Meroe solstitio vesperi paulisper adparet paucisque ante exortum Arcturi diebus pariter cum
179 die cernitur. navigantium haec maxime cursus deprehendunt, in alia adverso in alia prono mari, subitoque conspicuis atque ut e freto emergentibus quae in anfractu pilae latuere sideribus. neque enim, ut dixere aliqui, mundus hoc polo excelsiore se attollit, aut[1] undique cernerentur haec sidera; verum haec eadem quibusque proximis sublimiora creduntur eademque demersa longinquis, utque nunc sublimis in deictu positis videtur hic vertex, sic in illam terrae devexitatem transgressis illa se attollunt residentibus quae hic excelsa fuerant, quod nisi in figura pilae accidere non posset.

180 LXXII. Ideo defectus solis ac lunae vespertinos orientis incolae non sentiunt, nec matutinos ad occasum habitantes, meridianos vero serius nobis illi. apud Arbelam magni Alexandri victoria luna defecisse noctis secunda hora est prodita, eademque in Sicilia exoriens. solis defectum Vipstano et Fonteio coss., qui fuere ante paucos annos, factum pridie kalendas Maias Campania hora diei inter septimam et octavam sensit, Corbulo dux in Armenia inter horam diei decimam et undecimam prodidit visum, circuitu globi alia aliis detegente et occultante. quod si plana

[1] ita ut *Mayhoff.*

[a] As a matter of fact the eclipse was on Sept. 20, 331 B.C., eleven days before the battle.
[b] A.D. 59.

night and shows itself in the second; at Meroe it appears a little in the evening at midsummer and a few days before the rising of Arcturus is seen at daybreak. These phenomena are most clearly disclosed by the voyages of those at sea, the sea sloping upward in the direction of some and downward in the direction of others, and the stars that were hidden behind the curve of the ball suddenly becoming visible as it were rising out of the sea. For it is not the fact, as some have said, that the world rises up at this higher pole—or else these stars would be visible everywhere; but these stars are believed to be higher the nearer people are to them, while they seem low to those far away, and just as at present this pole seems lofty to those situated on the declivity, so when people pass across to yonder downward slope of the earth those stars rise while the ones that here were high sink, which could not happen except with the conformation of a ball.

Local visibility eclipses.

LXXII. Consequently inhabitants of the East do not perceive evening eclipses of the sun and moon, nor do those dwelling in the West see morning eclipses, while the latter see eclipses at midday later than we do. The victory of Alexander the Great is said to have caused an eclipse of the moon at Arbela at 8 p.m.[a] while the same eclipse in Sicily was when the moon was just rising. An eclipse of the sun that occurred on April 30 in the consulship[b] of Vipstanus and Fonteius a few years ago was visible in Campania between 1 and 2 p.m. but was reported by Corbulo commanding in Armenia as observed between 4 and 5: this was because the curve of the globe discloses and hides different phenomena for different localities. If the earth were

esset terra, simul omnia adparerent cunctis, noctesque non fierent inaequales, nam aeque aliis quam in medio sitis paria duodecim horarum intervalla cernerentur, quae nunc non in omni parte simili modo congruunt.

181 LXXIII. Ideo nec nox diesque, quamvis eadem, toto orbe simul est opposito globi noctem aut ambitu diem adferente. multis hoc cognitum experimentis, in Africa Hispaniaque turrium Hannibalis, in Asia vero propter piraticos terrores simili specularum praesidio excitato, in quis praenuntios ignes sexta hora diei accensos saepe conpertum est tertia noctis a tergo ultimis visos. eiusdem Alexandri cursor Philonides ex Sicyone Elin mille et ducenta stadia novem diei confecit horis, indeque, quamvis declivi itinere, tertia noctis hora remensus est saepius. causa, quod eunti cum sole iter erat, eundem remeans obvium contrario praetervertebat occursu. qua de causa ad occasum navigantes quamvis brevissimo die vincunt spatia nocturnae navigationis ut solem ipsum comitantes.

182 LXXIV. Vasaque horoscopica non ubique eadem sunt usui, in trecenis stadiis, aut ut longissime in quingentis, mutantibus semet umbris solis. itaque umbilici (quem gnomonem appellant) umbra in Aegypto meridiano tempore aequinocti die paulo

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[a] Cf. VII 20.

[b] Starting at daybreak, i.e. took 15 hours home as against 9 hours out. Taking the *mille passuum* of 8 stades (see *D. Ant. s.vv.*) at $\frac{10}{11}$ of an English mile, we get for the outward journey a pace of just over 15 miles an hour. But perhaps the length of the route is overestimated at 1200 stades, about 136 miles, as the distance from Sicyon to Elis measures only about 80 miles in a straight line on the map. Elis lies higher

flat, all would be visible to all alike at the same time; also the nights would not vary in length, because corresponding periods of 12 hours would be visible equally to others than those at the equator, periods that as it is do not exactly correspond in every region alike.

Sunrise and sunsets vary with longitude.

LXXIII. Consequently also although night and day are the same thing all over the world, it is not night and day at the same time all over the world, the intervention of the globe bringing night or its revolution day. This has been discovered by many experiments—that of Hannibal's towers in Africa and Spain, and in Asia when piratical alarms prompted the precaution of watchtowers of the same sort, warning fires lit on which at noon were often ascertained to have been seen by the people farthest to the rear at 9 p.m. Alexander above mentioned had a runner named Philonides [a] who did the 1200 stades from Sicyon to Elis in 9 hours from sunrise and took till 9 p.m.[b] for the return journey, although the way is downhill; this occurred repeatedly. The reason was that going his way lay with the sun but returning he was passing the sun as it met him travelling in the opposite direction. For this reason ships sailing westward beat even in the shortest day the distances they sail in the nights, because they are going with the actual sun.

Sun's altitude varies with latitude.

LXXIV. Travellers' sundials are not the same for reference everywhere, because the shadows thrown by the sun as they alter alter the readings at every 300 or at farthest 500 stades. Consequently in Egypt at midday on the day of the equinox the

above sea-level than Sicyon, but only the latter part of the return journey can be described as downhill.

plus quam dimidiam gnomonis mensuram efficit, in urbe Roma nona pars gnomonis deest umbrae, in oppido Ancona superest quinta tricesima, in parte Italiae quae Venetia appellatur iisdem horis umbra gnomoni par fit.

183 LXXV. Simili modo tradunt in Syene oppido, quod est supra Alexandriam quinque milibus stadiorum, solstiti die medio nullam umbram iaci, puteumque eius experimenti gratia factum totum inluminari, ex quo adparere tum solem illi loco supra verticem esse; quod et in India supra flumen Hypasim fieri tempore eodem Onesicritus scribit. constatque in Berenice urbe Trogodytarum, et inde stadiis quattuor milibus DCCCXX in eadem gente Ptolemaide oppido, quod in margine rubri maris ad primos elephantorum venatus conditum est, hoc idem ante solstitium quadragenis quinis diebus totidemque postea fieri, et
184 per eos XC dies in meridiem umbras iaci. rursus in Meroe (insula haec caputque gentis Aethiopum quinque milibus stadium a Syene in amne Nilo habitatur) bis anno absumi umbras, sole duodevicesimam tauri partem et quartamdecimam leonis tunc obtinente. in Indiae gente Oretum mons est Maleus nomine iuxta quem umbrae aestate in austrum, hieme in septentrionem iaciuntur; quindecim tantum noctibus ibi apparet septentrio. in eadem India Patalis, celeberrimo portu, sol dexter oritur, umbrae
185 in meridiem cadunt. septentrionem ibi Alexandro morante adnotatum prima tantum parte noctis

[a] The Beas.

shadow of the pin or 'gnomon' measures a little more than half the length of the gnomon itself, whereas in the city of Rome the shadow is $\frac{1}{9}$th shorter than the gnomon, at the town of Ancona $\frac{1}{35}$th longer, and in the district of Italy called Venezia the shadow is equal to the gnomon, at the same hours.

LXXV. Similarly it is reported that at the town of Syene, 5000 stades South of Alexandria, at noon in midsummer no shadow is cast, and that in a well made for the sake of testing this the light reaches to the bottom, clearly showing that the sun is vertically above that place at the time; and this is stated in the writings of Onesicritus also to occur at the same time in India South of the river Hypasis.[a] It is also stated that in the Cave-dwellers' city of Berenice, and 4820 stades away at the town of Ptolemais in the same tribe, which was founded on the shore of the Red Sea for the earliest elephant hunts, the same thing occurs 45 days before and 45 days after midsummer, and during that period of 90 days the shadows are thrown southward. Again in Meroe—this is an inhabited island in the river Nile 5000 stades from Syene, and is the capital of the Aethiopian race—the shadows disappear twice a year, when the sun is in the 18th degree of Taurus and in the 14th of Leo. There is a mountain named Maleus in the Indian tribe of the Oretes, near which shadows are thrown southward in summer and northward in winter; the northern constellation is visible there on only 15 nights. Also in India at the well-known port of Patala the sun rises on the right and shadows fall southward. It was noticed when Alexander was staying at this place that the Great and Little Bears were visible only in the early part of the

Stars and latitude.

adspici. Onesicritus, dux eius, scripsit quibus in locis Indiae umbrae non sint septentrionem non conspici, et ea loca appellari ascia, nec horas dinumerari ibi. LXXVI. At in tota Trogodytice umbras bis quadraginta quinque diebus in anno Eratosthenes in contrarium cadere prodidit.

186 LXXVII. Sic fit ut vario lucis incremento in Meroe longissimus dies XII horas aequinoctiales et octo partes unius horae colligat, Alexandriae vero XIV horas, in Italia XV, in Britannia XVII, ubi aestate lucidae noctes haut dubie repromittunt[1] id quod cogit ratio credi, solstiti diebus accedente sole propius verticem mundi angusto lucis ambitu subiecta terrae continuos dies habere senis mensibus,
187 noctesque e diverso ad brumam remoto. quod fieri in insula Thyle Pytheas Massiliensis scribit sex dierum navigatione in septentrionem a Britannia distante, quidam vero et in Mona, quae distat a Camaloduno Britanniae oppido circiter ducentis milibus, adfirmant.

LXXVIII. Umbrarum hanc rationem et quam vocant gnomonicen invenit Anaximenes Milesius, Anaximandri (de quo diximus) discipulus, primusque horologium quod appellant sciothericon Lacedaemone ostendit.

188 LXXIX. Ipsum diem alii aliter observavere, Babyloni inter duos solis exortus, Athenienses inter

[1] dubie se promittunt *Mayhoff*, dubitare promittunt *Detlefsen*.

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[a] This is inaccurate, as are other points in this passage.

[b] I.e. towards the South.

[c] I.e. all between the vernal and the autumnal equinox. Cf. IV. xx.

night. Alexander's guide Onesicritus wrote that this constellation is not visible at the places in India where there are no shadows, and that these places are called Shadeless, and no reckoning is kept of the hours there. LXXVI. But according to Eratosthenes in the whole[a] of Cave-dweller Country on 90 days once a year shadows fall the wrong way.[b]

Daylight varies with latitude.

LXXVII. Thus it comes about that owing to the varied lengthening of daylight the longest day covers $12\frac{8}{9}$ equinoctial hours at Meroe, but 14 hours at Alexandria, 15 in Italy, and 17 in Britain, where the light nights in summer substantiate what theory compels us to believe, that, as on summer days[c] the sun approaches nearer to the top of the world, owing to a narrow circuit of light the underlying parts of the earth have continuous days for 6 months at a time, and continuous nights when the sun has withdrawn in the opposite direction towards winter. Pytheas of Marseilles writes that this occurs in the island of Thule,[d] 6 days' voyage N. from Britain, and some declare it also to occur in the Isle of Anglesea, which is about 200 miles[e] from the British town of Colchester.

The first sundial.

LXXVIII. This theory of shadows and the science called gnomonics was discovered by Anaximenes of Miletus, the pupil of Anaximander of whom we have spoken; he first exhibited at Sparta the time-piece they call 'Hunt-the-Shadow.'

Day variously reckoned.

LXXIX. The actual period of a day has been differently kept by different people: the Babylonians count the period between two sunrises, the Athenians

[d] Now thought to be N.W. Norway.

[e] I.e. by the Roman Road from Colchester, the capital of the province, by Grantchester or Chesterton to Chester.

duos occasus, Umbri a meridie ad meridiem, vulgus omne a luce ad tenebras, sacerdotes Romani et qui diem diffiniere civilem, item Aegypti et Hipparchus, a media nocte in mediam. minora autem intervalla esse lucis inter occasus et[1] ortus solis iuxta solstitium[2] quam aequinoctia apparet quia positio signiferi circa media sui obliquior est, iuxta solstitium autem rectior.

189 LXXX. Contexenda sunt his caelestibus nexa causis. namque et Aethiopas vicini sideris vapore torreri adustisque similis gigni barba et capillo vibrato non est dubium, et adversa plaga mundi candida atque glaciali cute esse gentes flavis promissis[3] crinibus, trucis vero ex caeli rigore has, illas mobilitate sapientes; ipsoque crurum argumento illis in supera sucum revocari natura vaporis, his in inferas partes depelli umore deciduo; hic graves feras, illic varias effigies animalium provenire et maxime alitum [in multas figuras gigni[4] volucres[5]]; corporum autem proceritatem utrobique, illic ignium
190 nisu, hic umoris alimento; medio vero terrae salubri utrimque mixtura fertiles ad omnia tractus, modicos corporum habitus magna et in colore temperie, ritus

[1] occasus et *add. Rackham.* [2] *Rackham*: solstitia.
[3] *Rackham*: promissa. [4] *v.l.* igni.
[5] *s. cl. Detlefsen.*

[a] I.e. the summer solstice, as often.

[b] Cf. Galen *de temperamentis* III vi 72 *εἰ μὲν ὁμαλῶς ἔχει τὸ σῶμα τῆς κράσεως, οἷς μὲν ἰσχνὰ τὰ σκέλη ξηροὶ πάντως εἰσίν ὑγροὶ δὲ οἷς παχέα.*

that between two sunsets, the Umbrians from midday to midday, the common people everywhere from dawn to dark, the Roman priests and the authorities who fixed the official day, and also the Egyptians and Hipparchus, the period from midnight to midnight. But it is obvious that the breaks in daylight between sunset and sunrise are smaller near the solstice[a] than at the equinoxes, because the position of the zodiac is more slanting around its middle points but straighter near the solstice.

Climate a racial characteristics.

LXXX. We must deal next with the results connected with these heavenly causes. For it is beyond question that the Ethiopians are burnt by the heat of the heavenly body near them, and are born with a scorched appearance, with curly beard and hair, and that in the opposite region of the world the races have white frosty skins, with yellow hair that hangs straight; while the latter are fierce owing to the rigidity of their climate but the former wise because of the mobility of theirs; and their legs[b] themselves prove that with the former the juice is called away into the upper portions of the body by the nature of heat, while with the latter it is driven down to the lower parts by falling moisture; in the latter country dangerous wild beasts are found, in the former a great variety of animals and especially of birds; but in both regions men's stature is high, owing in the former to the pressure of the fires and in the latter to the nourishing effect of the damp; whereas in the middle of the earth, owing to a healthy blending of both elements, there are tracts that are fertile for all sorts of produce, and men are of medium bodily stature, with a marked blending even in the matter of complexion; customs are

molles, sensus liquidos, ingenia fecunda totiusque naturae capacis, isdem imperia, quae numquam extimis gentibus fuerint, sicut ne illae quidem his paruerint avolsae ac pro immanitate[1] naturae urguentis illas solitariae.

191 LXXXI. Babyloniorum placita et motus terrae hiatusque qua cetera omnia siderum vi existimant fieri, sed illorum trium quibus fulmina adsignant, fieri autem meantium cum sole aut congruentium et maxime circa quadrata mundi. praeclara quaedam et inmortalis in eo, si credimus, divinitas perhibetur Anaximandro Milesio physico, quem ferunt Lacedaemoniis praedixisse ut urbem ac tecta custodirent, instare enim motum terrae, et tum urbs tota eorum corruit et Taygeti montis magna pars ad formam puppis eminens abrupta cladem eam insuper ruina oppressit.[2] perhibetur et Pherecydi Pythagorae doctori alia coniectatio, sed et illa divina, haustu aquae e puteo praesensisse ac praedixisse civibus[3] terrae motum.

192 quae si vera sunt, quantum a deo tandem videri possunt tales distare dum vivant? et haec quidem arbitrio cuiusque existimanda relinquantur: ventos in causa esse non dubium reor; neque enim umquam

[1] *Hermolaus Barbarus*: nuntiate *aut* unitate *codd.*; numine *Mayhoff*, perversitate? *Campbell.*
[2] *Rackham*: pressit.
[3] civibus *Mayhoff*: tibi *aut* ibi *aut om. codd.*

[a] Saturn, Jupiter and Mars, cf. § 82.
[b] I.e. are in conjunction with the sun, or agree with him in aspect, and particularly when they are distant from him one quarter of the heaven (Brotier).

gentle, senses clear, intellects fertile and able to grasp the whole of nature; and they also have governments, which the outer races never have possessed, any more than they have ever been subject to the central races, being quite detached and solitary on account of the savagery of the nature that broods over those regions.

Earthquake, their causes

LXXXI. The theory of the Babylonians deems that even earthquakes and fissures in the ground are caused by the force of the stars that is the cause of all other phenomena, but only by that of those three stars[a] to which they assign thunderbolts; and that they occur when these are travelling with the sun or are in agreement with him, and particularly about the quadratures of the world.[b] On this subject a remarkable and immortal inspiration is attributed (if we can believe it) to the natural philosopher Anaximander of Miletus, who is said to have warned the Spartans to be careful of their city and buildings, because an earthquake was impending; and subsequently the whole of their city collapsed, and also a large part of Mount Taygetus projecting in the shape of a ship's stern broke off and crashing down on it added to the catastrophe. Also another conjecture is attributed to Pherecydes the teacher of Pythagoras, this also inspired: he is said to have foretold to his fellow-citizens an earthquake, of which he had obtained a premonition in drawing water from a well. Assuming the truth of these stories, how far pray can such men even in their lifetime be thought to differ from a god? And though these matters may be left to the estimation of individual judgment; I think it indubitable that their cause is to be attributed to the winds; for tremors of the earth never

intremiscunt terrae nisi sopito mari caeloque adeo tranquillo ut volatus avium non pendeant subtracto omni spiritu qui vehit, nec umquam nisi post ventos, condito scilicet in venas et cava eius occulta flatu. neque aliud est in terra tremor quam in nube tonitrum, nec hiatus aliud quam cum fulmen erumpit incluso spiritu luctante et ad libertatem exire nitente.

193 LXXXII. Varie itaque quatitur, et mira eduntur opera, alibi prostratis moenibus, alibi hiatu profundo haustis, alibi egestis molibus, alibi emissis amnibus, nonnumquam etiam ignibus calidisve fontibus, alibi averso fluminum cursu. praecedit vero comitaturque terribilis sonus, alias murmuri similis, alias mugitibus aut clamori humano armorumve pulsantium fragori, pro qualitate materiae excipientis formaque vel cavernarum vel cuniculi per quem meet, exilius grassante in angusto, eodem rauco in recurvis, resultante in duris, fervente in umidis, fluctuante in
194 stagnantibus, furente contra solida. itaque et sine motu saepe editur sonus. nec simplici modo quatitur nonnumquam,[1] sed tremit vibratque. hiatus vero alias remanet ostendens quae sorbuit, alias occultat ore conpresso rursusque ita inducto solo ut nulla

[1] *Detlefsen*: unquam.

occur except when the sea is calm and the sky so still that birds are unable to soar because all the breath that carries them has been withdrawn; and never except after wind, doubtless because then the blast has been shut up in the veins and hidden hollows of the sky. And a trembling in the earth is not different from a thunderclap in a cloud, and a fissure is no different from when an imprisoned current of air by struggling and striving to go forth to freedom causes a flash of lightning to burst out.

their phenomena and consequenc

LXXXII. Consequently earthquakes occur in a variety of ways, and cause remarkable consequences, in some places overthrowing walls, in others drawing them down into a gaping cleft, in others thrusting up masses of rock, in others sending out rivers and sometimes even fires or hot springs, in others diverting the course of rivers. They are however preceded or accompanied by a terrible sound, that sometimes resembles a rumble, sometimes the lowing of cattle or the shouts of human beings or the clash of weapons struck together, according to the nature of the material that receives the shock and the shape of the caverns or burrows through which it passes, proceeding with smaller volume in a narrow channel but with a harsh noise in channels that bend, echoing in hard channels, bubbling in damp ones, forming waves in stagnant ones, raging against solid ones. Accordingly even without any movement occurring a sound is sometimes emitted. And sometimes the earth is not shaken in a simple manner but trembles and vibrates. Also the gap sometimes remains open, showing the objects that it has sucked in, while sometimes it hides them by closing its mouth and drawing soil over it again in such a way as to

vestigia exstent: urbibus plerumque devoratis agrorumque tractu hausto, maritima autem maxime quatiuntur, nec montuosa tali malo carent: exploratum mihi est Alpes Appenninumque saepius tremuisse.

195 Et autumno ac vere terrae crebrius moventur, sicut fulmina. ideo Galliae et Aegyptus minime quatiuntur, quoniam hic aestatis causa obstat, illic hiemis. item noctu saepius quam interdiu. maximi autem motus existunt matutini vespertinique, sed propinqua luce crebri, interdiu autem circa meridiem. fiunt et solis lunaeque defectu, quoniam tempestates tunc sopiuntur, praecipue vero cum sequitur imbres aestus imbresve aestum.

196 LXXXIII. Navigantes quoque praesentiunt[1] non dubia coniectura sine flatu intumescente fluctu subito aut quatiente ictu. intremunt vero et in navibus postes aeque[2] quam in aedificiis crepituque praenuntiant; quin et volucres non inpavidae sedent. est et in caelo signum praeceditque motu futuro aut interdiu aut paulo post occasum sereno tenuis ceu linea nubes in longum porrecta spatium.

197 LXXXIV. Est et in puteis turbidior aqua nec sine odoris taedio, sicut in iisdem est remedium, quale et crebri specus praebent, conceptum enim spiritum

[1] *Rackham*: sentiunt.
[2] *Rueck*: positeque *vel* posita aeque.

leave no traces; it being usually cities that are engulfed, and a tract of farmland swallowed, although seaboard districts are most subject to earthquakes, and also mountainous regions are not free from disaster of the kind: I have ascertained that tremors have somewhat frequently occurred in the Alps and Apennines.

their seasons; Earthquakes are more frequent in autumn and spring, as is lightning. Consequently the Gallic provinces and Egypt suffer very little from them, as in the latter the summer is the cause that prevents them and in the former the winter. Similarly they are more frequent by night than in the daytime. The severest earthquakes occur in the morning and the evening, but they are frequent near dawn and in the daytime about noon. They also occur at an eclipse of the sun or moon, since then storms are lulled, but particularly when heat follows rain or rain heat.

signs of th[e] impendin[g] LXXXIII. Sailors at sea can also anticipate an earthquake and forecast it with certainty when a sudden wave swells up without there being a wind, or a shock shakes the vessel. Even in ships posts begin to tremble just as they do in buildings, and foretell an earthquake by rattling; nay more, birds of timid kinds perch on the rigging. There is also a sign in the sky: when an earthquake is impending, either in the daytime or a little after sunset, in fine weather, it is preceded by a thin streak of cloud stretching over a wide space.

protection against; LXXXIV. Another sign is when the water in wells is muddier and has a somewhat foul smell, just as in wells there is also a remedy for earthquake such as frequently caves too afford, as they supply

exhalant. quod in totis notatur oppidis: minus quatiuntur crebris ad eluviem cuniculis cavata, multoque sunt tutiora in iisdem illis quae pendent, sicuti Neapoli in Italia intellegitur, parte eius quae solida est ad tales casus obnoxia. tutissimi sunt aedificiorum fornices, anguli quoque parietum postesque alterno pulsu renitentes; et latere terreno
198 facti parietes minore noxa quatiuntur. magna differentia est et in ipso genere motus, pluribus siquidem modis quatitur; tutissimum est cum vibrat crispante aedificiorum crepitu et cum intumescit adsurgens alternoque motu residit; innoxium et cum concurrentia tecta contrario ictu arietant, quoniam alter motus alteri renititur. undantis inclinatio et fluctus more quaedam volutatio infesta est, aut cum in unam partem totus se motus inpellit. desinunt autem tremores cum ventus emersit, sin vero duravere, non ante XL dies sistuntur, plerumque et tardius, utpote cum quidam annuo et bienni spatio duraverint.

199 LXXXV. Factum est semel, quod equidem in Etruscae disciplinae voluminibus invenio, ingens terrarum portentum L. Marcio Sexto Iulio coss. in agro Mutinensi. namque montes duo inter se concurrerunt crepitu maximo adsultantes recedentesque, inter eos flamma fumoque in caelum exeunte interdiu, spectante e via Aemilia magna equitum Romanorum familiarumque et viatorum multitudine. eo con-

[a] 91 B.C.

an outlet for the confined breath. This is noticed in whole towns: buildings pierced by frequent conduits for drainage are less shaken, and also among these the ones erected over vaults are much safer—as is noticed in Italy at Naples, the solidly built portion of the city being specially liable to collapses of this nature. The safest parts of buildings are arches, also angles of walls, and posts, which swing back into position with each alternate thrust; and walls built of clay bricks suffer less damage from being shaken. There is also a great difference in the actual kind of movement, as the earth shakes in several ways; there is least danger when it quivers with a trembling rattle of the buildings, and when it rises in a swell and settles back again, with an alternating motion; also no harm is done when buildings collide and ram against each other, as the one motion counteracts the other. A waving bend and a sort of billowy fluctuation is dangerous, or when the whole movement drives in one direction. Earthquakes stop when the wind has found an outlet, or else, if they go on, they do not stop before forty days, and usually even longer, some in fact having gone on for one or two years' time.

varieties of

LXXXV. I find in the books of the lore of Tuscany that once a vast and portentous earthquake occurred in the district of Modena; this was during the consulship[a] of Lucius Marcius and Sextus Julius. Two mountains ran together with a mighty crash, leaping forward and then retiring with flames and smoke rising between them to the sky; this took place in the daytime, and was watched from the Aemilian road by a large crowd of Knights of Rome with their retinues and passers by. The shock

historical cases of;

cursu villae omnes elisae, animalia permulta quae intra fuerant exanimata sunt. anno ante sociale bellum quod haud scio an funestius terrae ipsi Italiae fuerit quam bella civilia. non minus mirum ostentum et nostra cognovit aetas anno Neronis principis supremo, sicut in rebus eius exposuimus, pratis oleisque intercedente publica via in contrarias sedis transgressis in agro Marrucino, praediis Vetti Marcelli equitis Romani res Neronis procurantis.

200 LXXXVI. Fiunt simul cum terrae motu et inundationes maris eodem videlicet spiritu infusi aut terrae sidentis sinu recepti. maximus terrae memoria mortalium exstitit motus Tiberii Caesaris principatu, XII urbibus Asiae una nocte prostratis, creberrimus Punico bello intra eundem annum septies ac quinquagies nuntiatus Romam, quo quidem anno ad Trasimenum lacum dimicantes maximum motum nec Poeni sensere nec Romani. nec vero simplex malum aut in ipso tantum motu periculum est, sed par aut maius ostento [1]: numquam urbs Roma tremuit ut non futuri eventus alicuius id praenuntium esset.

201 LXXXVII. Eadem nascentium causa terrarum est, cum idem ille spiritus adtollendo potens solo non valuit erumpere. nascuntur enim nec fluminum

[1] ?⟨in⟩ ostento *Rackham.*

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[a] A.D. 68.

[b] The neighbourhood of Teate, now Chieti, on the Adriatic coast.

[c] 217 B.C.

[d] Lago di Perugia.

brought down all the country houses, and a great many animals in the buildings were killed. It was in the year before the Allies' War, which was perhaps more disastrous to the land of Italy than the civil wars. Our generation also experienced a not less marvellous manifestation in the last year [a] of the Emperor Nero, as we have set forth in our history of his principate: meadows and olive trees with a public road running between them got over to the opposite sides of the road; this took place in the Marrucinian territory,[b] on the lands of Vettius Marcellus, Knight of Rome, Nero's estate-manager.

consequences of: (1) inundations;

LXXXVI. Earthquakes are accompanied by inundations of the sea, which is presumably caused to flood the land by the same current of air, or drawn into the bosom of the earth as it subsides. The greatest earthquake in human memory occurred when Tiberius Caesar was emperor, twelve Asiatic cities being overthrown in one night; the most numerous series of shocks was during the Punic War, when reports reached Rome of fifty-seven in a single year; it was the year [c] when a violent earthquake occurring during an action between the Carthaginian and Roman armies at Lake Trasimene [d] was not noticed by the combatants on either side. Nor yet is the disaster a simple one, nor does the danger consist only in the earthquake itself, but equally or more in the fact that it is a portent; the city of Rome was never shaken without this being a premonition of something about to happen.

(Earthquakes portentous.)

(2) new land formations.

LXXXVII. The cause of the birth of new lands is the same, when that same breath although powerful enough to cause an upheaval of the soil has not been able to force an exit. For lands are born not only

tantum invectu (sicut Echinades insulae ab Acheloo amne congestae maiorque pars Aegypti a Nilo in quam a Pharo insula noctis et diei cursum fuisse Homero credimus) nec recessu maris, sicut idem Circeis, quod accidisse et in Ambraciae portu decem milium passuum intervallo et Atheniensium quinque milium ad Piraeeum memoratur, et Ephesi ubi quondam aedem Dianae adluebat. Herodoto quidem si credimus, mare fuit supra Memphim usque ad Aethiopum montes itemque a planis Arabiae, mare circa Ilium et tota Teuthranie quaque campos intulerit Maeander.

202 LXXXVIII. Nascuntur et alio modo terrae ac repente in alio [1] mari emergunt velut paria secum faciente natura quaeque hauserit hiatus alio loco reddente.

LXXXIX. Clarae iam pridem insulae Delos et Rhodos memoriae produntur enatae, postea minores, ultra Melon Anaphe, inter Lemnum et Hellespontum Neae, inter Lebedum et Teon Halone, inter Cycladas Olympiadis CXLV anno quarto Thera et Therasia, inter easdem post annos CXXX Hiera, eademquae Automate, et ab ea duobus stadiis post annos CX in nostro aevo M. Iunio Silano L. Balbo coss. a. d. VIII Idus Iulias Thia.

[1] *v.l.* aliquo.

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[a] *Odyssey* IV. 354. [b] II. 10.
[c] A legendary king in Mysia.
[d] The river between Lydia and Caria.
[e] 197 B.C. The figures in this passage are very uncertain.
[f] A.D. 19.

through the conveyance of soil by streams (as the Echinades Islands when heaped up from the river Achelous and the greater part of Egypt from the Nile—the crossing from the island of Pharos to the coast, if we believe Homer,[a] having formerly taken twenty-four hours) or by the retirement of the sea as once took place at Circei; such a retirement is also recorded to have occurred to a distance of 10,000 paces in the harbour of Ambracia, and to a distance of 5,000 at the Athenian port of Piraeus; and at Ephesus, where once the sea used to wash up to the temple of Diana. At all events if we believe Herodotus,[b] there was sea above Memphis as far as the mountains of Ethiopia and also towards the plains of Arabia, and sea round Ilium, and over the whole territory of Teuthras [c] and where the Maeander [d] has spread prairie-land.

Other new land formations.

LXXXVIII. New lands are also formed in another way, and suddenly emerge in a different sea, nature as it were balancing accounts with herself and restoring in another place what an earthquake has engulfed.

Emergence of islands.

LXXXIX. The famous islands of Delos and Rhodes are recorded in history as having been born from the sea long ago, and subsequently smaller ones, Anaphe beyond Melos, Neae between Lemnos and the Dardanelles, Halone between Lebedos and Teos, Thera and Therasia among the Cyclades in the 4th year [e] of the 145th Olympiad; also in the same group Hiera, which is the same as Automate, 130 years later; and 2 stades from Hiera, Thia 110 years later, in our age, on July 8 in the year [f] of the consulship of Marcus Junius Silanus and Lucius Balbus.

203 Ante nos et iuxta Italiam inter Aeolias insulas, item iuxta Cretam emersit MMD passuum una cum calidis fontibus, altera Olympiadis CLXIII anno tertio in Tusco sinu, flagrans haec violento cum flatu: proditurque memoriae magna circa eam multitudine piscium fluitante confestim expirasse quibus ex his cibus fuisset. sic et Pithecussas in Campano sinu ferunt ortas, mox in his montem Epopon, cum repente flamma ex eo emicuisset, campestri aequatum planitiei. in eadem et oppidum haustum profundo, alioque motu terrae stagnum emersisse, et alio provolutis montibus insulam extitisse Prochytam.

204 XC. Namque et hoc modo insulas rerum natura fecit: avellit Siciliam Italiae, Cyprum Syriae, Euboeam Boeotiae, Euboeae Atalanten et Macrian, Besbicum Bithyniae, Leucosiam Sirenum promunturio. XCI. Rursus abstulit insulas mari iunxitque terris, Antissam Lesbo, Zephyrium Halicarnasso, Aethusan Myndo, Dromiscon et Pernen Mileto, Narthecusam Parthenio promunturio. Hybanda quondam insula Ioniae ducentis nunc a mari abest stadiis, Syrien Ephesus in mediterraneo habet, Derasidas et Sapphoniam vicina ei Magnesia. Epidaurus et Oricum insulae esse desierunt.

205 XCII. In totum abstulit terras primum omnium ubi Atlanticum mare est, si Platoni credimus,

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[a] 126 B.C. [b] *Timaeus* 24 E.

Before our time also among the Aeolian Islands near Italy, as well as near Crete, there emerged from the sea one island 2500 paces long, with hot springs, and another in the 3rd year [a] of Olympiad 163 in the bay of Tuscany, this one burning with a violent blast of air; and it is recorded that a great quantity of fish were floating round it, and that people who ate of them immediately expired. So also the Monkey Islands are said to have risen in the bay of Campania, and later one among them, Mount Epopos, is said to have suddenly shot up a great flame and then to have been levelled with the surface of the plain. In the same plain also a town was sucked down into the depths, and another earthquake caused a swamp to emerge, and another overturned mountains and threw up the island of Procida.

Detachment of islands from mainland.

XC. For another way also in which nature has made islands is when she tore Sicily away from Italy, Cyprus from Syria, Euboea from Boeotia, Atalantes and Macrias from Euboea, Besbicus from Bithynia, Leucosia from the Sirens' Cape. XCI. Again she has taken islands away from the sea and joined them to the land—Antissa to Lesbos, Zephyrius to Halicarnassus, Aethusa to Myndus, Dromiscos and Pernes to Miletus, Narthecusa to Cape Parthenius. Hybanda, once an Ionian island, is now 25 miles distant from the sea, Ephesus has Syrie as part of the mainland, and its neighbour Magnesia the Derasides and Sapphonia. Epidaurus and Oricum have ceased to be islands.

Encroachment of sea.

XCII. Cases of land entirely stolen away by the sea are, first of all (if we accept Plato's story [b]), the vast area covered by the Atlantic, and next, in the

inmenso spatio, mox interno quoque[1] quae videmus hodie, mersam Acarnaniam Ambracio sinu, Achaiam Corinthio, Europam Asiamque Propontide et Ponto. Ad hoc perrupit mare Leucada, Antirrhium, Hellespontum, Bosporos duos.

XCIII. Atque ut sinus et stagna praeteream, ipsa se comest terra. devoravit Cibotum altissimum montem cum oppido Cariae, Sipylum in Magnesia et prius in eodem loco clarissimam urbem quae Tantalis vocabatur, Galenes et Galames urbium in Phoenice agros cum ipsis, Phegium Aethiopiae iugum excelsissimum, tamquam non infida grassa-
206 rentur et litora. XCIV. Pyrram et Antissam circa Maeotim Pontus abstulit, Helicen et Buram sinus Corinthius, quarum in alto vestigia apparent. ex insula Cea amplius triginta milia passuum abrupta subito cum plurimis mortalibus rapuit, et in Sicilia dimidiam Tyndarida urbem ac quicquid ab Italia deest, similiter in Boeotia Eleusina.

XCV. Motus enim terrae sileantur et quicquid est ubi saltem busta urbium exstant, simul[2] terrae miracula potius dicamus quam scelera naturae. et, Hercule, non caelestia enarratu difficiliora fuerint:
207 metallorum opulentia tam varia, tam dives, tam fecunda, tot saeculis suboriens, cum tantum cotidie orbe toto populentur ignes, ruinae, naufragia, bella,

[1] quoque *add. Mayhoff* (*om.* quae). [2] *Rackham*: simul ut.

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[a] This long peninsula off the W. coast of Acarnania was made into an island by the Corinthians who in the 7th cent. B.C. cut a canal through the isthmus joining it with the mainland.

[b] The Channel of Istambul and the Kertsch from the Black Sea to the Sea of Azov.

inland seas also, the areas that we see submerged at the present day, Acarnania covered by the Ambracian Gulf, Achaea by the Gulf of Corinth, Europe and Asia by the Sea of Marmora and the Black Sea. Also the sea has made the channels of Leucas,[a] Antirrhium, the Dardanelles and the two Bospori.[b]

Collapse of mountains

XCIII. And to pass over bays and marshes, the earth is eaten up by herself. She has devoured the highest mountain in Caria, Cibotus, together with the town of that name, Sipylus in Magnesia, and previously the very celebrated city in the same place that used to be called Tantalis, the territories of Galene and Galame in Phoenicia with the cities themselves, and the loftiest mountain range in Ethiopia, Phegium—just as if the coasts also did not treacherously encroach! XCIV. The Black Sea has stolen Pyrra and Antissa in the neighbourhood of Lake Maeotis, the Gulf of Corinth Helice and Bura, traces of which are visible at the bottom of the water. The sea suddenly snatched away more than 30,000 paces together with most of the human beings from the Island of Ceos, and half the city of Tyndaris in Sicily, and all the gap in the coast of Italy, and similarly Eleusis in Boeotia.

Products of earth: minerals, gems, emanations

XCV. For let earthquakes not be mentioned, and every case where at least the tombs of cities survive, and at the same time let us tell of the marvels of the earth rather than the crimes of nature. And, I will swear, not even the heavenly phenomena could have been more difficult to recount: the wealth of mines so varied, so opulent, so prolific, brought to the surface in so many ages, although every day all over the world so much devastation is wrought by fires, collapse of buildings, shipwrecks, wars, frauds,

fraudes, tantum vero luxuria et tot mortales conterant, gemmarum pictura tam multiplex, lapidum tam discolores maculae, interque eos candor alicuius praeter lucem omnia excludens, medicatorum fontium vis, ignium tot locis emicantium perpetua tot saeculis incendia, spiritus letales aut[1] scrobibus emissi aut ipso loci situ, mortiferi alibi volucribus tantum, ut
208 Soracte vicino urbi tractu, alibi praeter hominem ceteris animantibus, nonnumquam et homini, ut in Sinuessano agro et Puteolano, quae spiracula vocant, alii Charonea, scrobes mortiferum spiritum exhalantes, item in Hirpinis Ampsancti ad Mephitis aedem locum quem qui intravere moriuntur, simili modo Hierapoli in Asia Matris tantum Magnae sacerdoti innoxium; alibi fatidici specus, quorum exhalatione temulenti futura praecinant, ut Delphis nobilissimo oraculo. Quibus in rebus quid possit aliud causae adferre mortalium quispiam quam diffusae per omne naturae subinde aliter atque aliter numen erumpens?

209 XCVI. Quaedam vero terrae ad ingressus tremunt, sicut in Gabiensi agro non procul urbe Roma iugera ferme ducenta equitantium cursu, similiter in Reatino. quaedam insulae semper fluctuantur, sicut in agro Caecubo et eodem Reatino, Mutinensi, Statoniensi, in Vadimonis lacu, ad Cutilias aquas

[1] *Rackham*: alibi aut.

[a] Phengitis, described XXXVI 163 as translucent but not transparent.

and so great is the consumption of luxury and of the multitudes of mankind; such a variety of patterned gems, such many-coloured markings in stones, and among them the brilliance of a certain stone[a] that only allows actual daylight to penetrate through it; the profusion of medicinal springs; the flames of fire flickering up in so many places, unceasing for so many centuries; the lethal breaths either emitted from chasms or due to the mere formation of the ground, in some places fatal only to birds, as in the region of Soracte near Rome, in others to all living creatures except man, and sometimes to man also, as in the territory of Sinuessa and of Pozzuoli—the places called breathing holes, or by other people jaws of hell—ditches that exhale a deadly breath; also the place near the Temple of Mephitis at Ampsanctus in the Hirpinian district, on entering which people die; likewise the hole at Hierapolis in Asia, harmless only to the priest of the Great Mother; elsewhere prophetic caves, those intoxicated by whose exhalations foretell the future, as at the very famous oracle at Delphi. In these matters what other explanation could any mortal man adduce save that they are caused by the divine power of that nature which is diffused throughout the universe, repeatedly bursting out in different ways?

XCVI. In some places, the earth trembles when trodden on—for instance in the Gabii district not far from the city of Rome about 200 acres shake when horsemen gallop over them, and similarly in the Reate district. Certain islands are always afloat, as in the districts of Caecubum and of Reate mentioned above and Modena and Statonium, and in Lake Vadimo, the dense wood near the springs of *Earth tremors.* *Floating islands.*

opaca silva quae numquam die ac nocte eodem loco visitur, in Lydia quae vocantur Calaminae non ventis solum sed etiam contis quo libeat inpulsae, multorum civium Mithridatico bello salus. sunt et in Nymphaeo parvae, Saliares dictae, quoniam in symphoniae cantu ad ictus modulantium pedum moventur. in Tarquiniensi lacu magno Italiae duae nemora circumferunt, nunc triquetram figuram edentes nunc rotundam conplexu ventis impellentibus, quadratam numquam.

210 XCVII. Celebre fanum habet Veneris Paphos, in cuius quandam aream non impluit, item in Nea, oppido Troadis, circa simulacrum Minervae, in eodem
211 et relicta sacrificia non putrescunt. XCVIII. iuxta Harpasa oppidum Asiae cautes stat horrenda uno digito mobilis, eadem, si toto corpore inpellatur, resistens. in Taurorum paeninsula in civitate Parasino terra est qua sanantur omnia vulnera. at circa Asson Troadis lapis nascitur quo consumuntur omnia corpora; sarcophagus vocatur. duo sunt montes iuxta flumen Indum quorum[1] alteri natura ut ferrum omne teneat, alteri ut respuat; itaque si sint clavi in calciamento, vestigia avelli in altero non posse, in altero sisti. Locris et Crotone pestilentiam numquam fuisse nec ullo terrae motu laboratum adnotatum est, in Lycia vero semper a terrae motu quadraginta

[1] quorum *add. Rackham.*

[a] A promontory in Illyria.

Cutilia which is never to be seen in the same place by day and by night, the islands in Lydia named the Reed Islands which are not only driven by the winds, but can be punted in any direction at pleasure with poles, and so served to rescue a number of the citizens in the Mithridatic war. There are also small islands at Nymphaeum[a] called the Dancing Islands, because they move to the foot-beats of persons keeping time with the chanting of a choral song. On the great lake of Tarquinii in Italy two islands float about carrying woods, their outline as the winds drive them forward now forming the shape of a triangle and now of a circle, but never a square.

XCVII. Paphos possesses a famous shrine of Venus on a certain court in which rain does not fall, and the same in the case round an image of Minerva at the town of Nea in the Troad; in the same town also sacrifices left over do not go bad. XCVIII. Near the town of Harpasa in Asia stands a jagged rock that can be moved with one finger, but that also resists a push made with the whole body. On the peninsula of Tauri in the state of Parasinum there is some earth which heals all wounds. But in the neighbourhood of Assos in the Troad a stone is produced that causes all bodies to waste away; it is called the Flesh-eater. There are two mountains near the river Indus, the nature of one of which is to hold all iron and that of the other to reject it; consequently if a man has nails in his shoes, on one of the mountains at each step he is unable to tear his foot away from the ground and on the other he cannot set it down on the ground. It is recorded that at Locri and Croton there has never been a plague or earthquake, and that in Lycia an earth-

Local earth marvels.

dies serenos esse. in agro Arpano frumentum satum non nascitur, ad aras Mucias in Veiente et apud Tusculanum et in silva Ciminia loca sunt in quibus in terram depacta non extrahuntur. in Crustumino natum faenum ibi noxium, extra salubre est.

212 XCIX. Et de aquarum natura complura dicta sunt. sed aestus maris accedere et reciprocare maxime mirum, pluribus quidem modis. verum causa in sole lunaque. bis inter duos exortus lunae adfluunt bisque remeant vicenis quaternisque semper horis, et primum attollente se cum ea mundo intumescentes, mox a meridiano caeli fastigio vergente in occasum residentes, rursusque ab occasu sub terra[1] ad caeli ima et meridiano contraria accedente inundantes, hinc donec iterum exoriatur se resorbentes;
213 nec umquam eodem tempore quo pridie reflui, velut[2] anhelantes[3] sidere avido trahente secum haustu maria et adsidue aliunde quam pridie exoriente; paribus tamen intervallis reciproci senisque semper horis, non cuiusque diei aut noctis aut loci sed aequinoctialibus, ideoque inaequales volgarium horarum spatio utcumque plures in eos aut diei aut noctis illarum mensurae cadunt, et aequinoc-
214 tio tantum pares ubique. ingens argumentum plenumque lucis, ac vocis etiam diuinae, hebetes esse qui negent suptermeare sidera ac rursus eadem exsurgere, similemque terris, immo vero naturae uni-

[1] *Detlefsen*: subter. [2] *Rueck*: reflui ut.
[3] *Mayhoff* (*cf. Mela* III 2): ancillantes.

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[a] The Roman hour was a twelfth part of actual daytime or night-time, thus varying in length throughout the year; and only at the equinox was a diurnal hour equal to a nocturnal hour, an exact twenty-fourth of day and night.

quake is always followed by forty days' fine weather. Corn sown in the Arpi district does not come up, and at Mucian Altars in the district of Veii and at Tusculum and in the Ciminian Forest there are places where stakes driven into the ground cannot be pulled out. Hay grown in the Crustumium district is noxious on the spot but healthy when conveyed elsewhere.

XCIX. About the nature of bodies of water a great deal has been said. But the rise and fall of the tides of the sea is extremely mysterious, at all events in its irregularity; however the cause lies in the sun and moon. Between two risings of the moon there are two high and two low tides every 24 hours, the tide first swelling as the world moves upward with the moon, then falling as it slopes from the midday summit of the sky towards sunset, and again coming in as after sunset the world goes below the earth to the lowest parts of the heaven and approaches the regions opposite to the meridian, and from that point sucking back until it rises again; and never flowing back at the same time as the day before, just as if gasping for breath as the greedy star draws the seas with it at a draught and constantly rises from another point than the day before; yet returning at equal intervals and in every six hours, not of each day or night or place but equinoctial hours, so that the tidal periods are not equal by the space of ordinary hours whenever the tides occupy larger measures of either diurnal or nocturnal hours, and only equal everywhere at the equinox.[a] It is a vast and illuminating proof, and one of even divine utterance, that those are dull of wit who deny that the same stars pass below the earth and rise up again, and that they present a similar appearance to the

Tides, theory of.

versae, exinde[1] faciem in iisdem ortus occasusque operibus, non aliter sub terra manifesto sideris cursu aliove effectu quam cum praeter oculos nostros feratur.

215 Multiplex etiamnum lunaris differentia, primumque septenis diebus: quippe modici a nova ad dividuam aestus pleniores ab ea exundant plenaque maxime fervent; inde mitescunt, pares ad septimam primis, iterumque alio latere dividua augentur, in coitu solis pares plenae. eadem in[2] aquilonia et a terris longius recendente mitiores quam cum in austros digressa propiore nisu vim suam exercet. per octonos quosque annos ad principia motus et paria incrementa centesimo lunae revocantur ambitu. augent[3] ea cuncta solis annuis causis, duobus aequinoctiis maxime tumentes et autumnali amplius quam verno, inanes vero

216 bruma et magis solstitio. nec tamen in ipsis quos dixi temporum articulis, sed paucis post diebus, sicuti neque in plena aut novissima sed postea, nec statim ut lunam mundus ostendat occultetve aut media plaga declinet verum fere duabus horis aequinoctialibus serius, tardiore semper ad terras omnium quae geruntur in caelo effectu cadente quam visu, sicuti fulguris et tonitrus et fulminum.

[1] *v.l.* et inde: ostendi? *Campbell.*
[2] *v.l. om.* in.
[3] *Mayhoff:* augente.

lands and indeed to the whole of nature in the same processes of rising and setting, the course or other operation of a star being manifest beneath the earth in just the same way as when it is travelling past our eyes.

Moreover, the lunar difference is manifold, and to begin with, its period is seven days: inasmuch as the tides, which are moderate from new moon to half-moon, therefrom rise higher and at full moon are at their maximum; after that they relax, at the seventh day being equal to what they were at first; and they increase again when the moon divides on the other side, at the union of the moon with the sun being equal to what they were at full moon. When the moon is northward and retiring further from the earth the tides are gentler than when she has swerved towards the south and exerts her force at a nearer angle. At every eighth year the tides are brought back at the hundredth circuit of the moon to the beginnings of their motion and to corresponding stages of increase. They make all these increases owing to the yearly influences of the sun, swelling most at the two equinoxes and more at the autumn than the spring one, but empty at midwinter and more so at midsummer. Nevertheless this does not occur at the exact points of time I have specified, but a few days after, just as it is not at full or new moon but afterwards, and not immediately when the world shows or hides the moon or slopes it in the middle quarter, but about two equinoctial hours later, the effect of all the occurrences in the sky reaching the earth more slowly than the sight of them, as is the case with lightning, thunder and thunder-bolts.

Tides and lunar periods.

217 Omnes autem aestus in oceano maiora integunt spatia nudantque quam in reliquo mari, sive quia motum universitate animosius quam parte est, sive quia magnitudo aperta sideris vim laxe grassantis efficacius sentit, eandem angustiis arcentibus, qua de causa nec lacus nec amnes similiter moventur. (octogenis cubitis supra Britanniam intumescere aestus Pytheas Massiliensis auctor est). et interiora
218 autem maria terris clauduntur ut in[1] portu; quibusdam tamen in locis spatiosior laxitas dicioni paret, utpote cum plura exempla sint in tranquillo mari nulloque velorum pulsu tertio die ex Italia pervectorum Uticam aestu fervente. circa litora autem magis quam in alto deprehenduntur hi motus, quoniam et in corpore extrema pulsum venarum, id est spiritus, magis sentiunt. in plerisque tamen aestuaris propter dispares siderum in quoque tractu exortus diversi existunt aestus tempore, non ratione, discordes, sicut in Syrtibus.

219 C. Et quorundam tamen privata natura est, velut Tauromenitani euripi saepius et in Euboea septies die ac nocte reciprocantis. idem aestus triduo in mense consistit, septima octava nonaque luna. Gadibus qui est delubro Herculis proximus fons inclusus ad putei modum alias simul cum oceano augetur minuiturque, alias utrumque contrariis temporibus; eodem in loco alter oceani motibus

[1] in *add. Mayhoff.*

[a] I.e. the moon. [b] I.e. the Straits of Messina.

Ocean tides higher than those of inland seas.

But all the tides cover and lay bare greater spaces in the ocean than in the rest of the sea, whether because it is more furious when moved in its entirety than when in part, or because the open extent feels the force of the star[a] when it marches untrammeled with more effect, whereas narrow spaces hinder the force, which is the reason why neither lakes nor rivers have tides like the ocean (Pytheas of Marseilles states that north of Britain the tides rise 120 ft.) But also the more inland seas are shut in by land like the water in a harbour; yet a more untrammeled expanse is subject to the tidal sway, inasmuch as there are several instances of people making the crossing from Italy to Utica in two days in a calm sea and with no wind in the sails when a strong tide was running. But these motions are observed more round the coasts than in the deep sea, since in the body too the extremities are more sensitive to the pulse of the veins, that is of the breath. But in most estuaries owing to the different risings of the stars in each region the tides occur irregularly, varying in time though not in method, as for instance in the Syrtes.

Exceptional local tides.

C. And nevertheless some tides have a special nature, for instance the channel at Taormina[b] that ebbs and flows more frequently, and the one at Euboea that has seven tides in twenty-four hours. The tide at Euboea stops three times a month, on the seventh, eighth and ninth day after the new moon. At Cadiz the spring nearest the shrine of Hercules, which is enclosed like a well, sometimes rises and sinks with the ocean and sometimes does both at the contrary periods; a second spring in the same place agrees with the motions of the ocean.

consentit. in ripa Baetis oppidum est cuius putei crescente aestu minuuntur, augescunt decedente, mediis temporum immobiles. eadem natura Hispali in ipso oppido [1] uni puteo, ceteris vulgaris. et Pontus semper extra meat in Propontidem, introrsus in Pontum numquam refluo mari.

220 CI. Omnia pleno fluctu [2] maria purgantur, quaedam et stato tempore. circa Messanam et Mylas fimo similia expuuntur in litus purgamenta, unde fabula est Solis boves ibi stabulari. his addit (ut nihil quod equidem noverim praeteream) Aristoteles nullum animal nisi aestu recedente expirare. Observatum id multum in Gallico oceano et dumtaxat in homine compertum.

221 CII. Quo vera coniectatio existit haut frustra spiritus sidus lunam [3] existimari, hoc esse quod terras saturet, accedensque corpora impleat, abscedens inaniat; ideo cum incremento eius augeri conchylia, et maxime spiritum sentire quibus sanguis non sit, sed et sanguinem hominum etiam cum lumine eius augeri ac minui, frondes quoque ac pabula (ut suo loco dicetur) sentire, in omnia eadem penetrante vi.

222 CIII. Itaque solis ardore siccatur liquor, et hoc esse masculum sidus accepimus, torrens cuncta sorbensque; sic mari late patenti saporem incoqui salis, aut

[1] *Rackham*: Hispali (*v.ll.* in ipsote, in Hispali) oppido.
[2] *Mayhoff*: pleni unio.
[3] spiritum sidus lunae *edd. vett.*

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[a] Or, emending the text, 'the moon's star is believed to be breath.'
[b] XVIII. 321 ff.

There is a town on the banks of the Guadalquivir whose wells sink when the tide rises and rise when it falls, remaining stationary in the intervening periods. At Seville there is one well in the actual town that has the same nature, though all the others are as usual. The Black Sea always flows out into the Sea of Marmora—the tide never sets inward into the Black Sea.

CI. All seas excrete refuse at high tide, some also periodically. In the neighbourhood of Messina and Mylae scum resembling dung is spat out on to the shore, which is the origin of the story that this is the place where the Oxen of the Sun are stalled. To this (so that I may leave out nothing that is within my knowledge) Aristotle adds that no animal dies except when the tide is ebbing. This has been widely noticed in the Gallic Ocean, and has been found to hold good at all events in the case of man. *Tidal refu*

CII. This is the source of the true conjecture that the moon is rightly believed to be the star of the breath,[a] and that it is this star that saturates the earth and fills bodies by its approach and empties them by its departure; and that consequently shells increase in size as the moon waxes, and that its breath is specially felt by bloodless creatures, but also the blood even of human beings increases and diminishes with its light; and that also leaves and herbage (as will be stated in the proper place [b]) are sensitive to it, the same force penetrating into all things. *Lunar influence.*

CIII. Consequently liquid is dried by the heat of the sun, and we are taught that this is the male star, which scorches and sucks up everything; and that in this way the flavour of salt is boiled into the *Effects of sunlight.*

quia exhausto inde dulci tenuique, quod facillime trahat vis ignea, omne asperius crassiusque linquatur (ideo summa aequorum aqua dulciorem profundam,[1] hanc esse veriorem causam asperi saporis quam quod mare terrae sudor sit aeternus), aut quia plurimus ex arido misceatur illi vapor, aut quia terrae natura sicut medicatas aquas inficiat. est in exemplis Dionysio Siciliae tyranno, cum pulsus est ea potentia, accidisse prodigium ut uno die in portu dulcesceret mare.

223 CIV. E contrario ferunt lunae femineum ac molle sidus, atque nocturnum solvere umorem et trahere, non auferre. id manifestum esse quod ferarum occisa corpora in tabem visu suo resolvat, somnoque sopitis torporem contractum in caput revocet, glaciem refundat, cunctaque umifico spiritu laxet: ita pensari naturae vices semperque sufficere, aliis siderum elementa cogentibus, aliis vero fundentibus. sed in dulcibus aquis lunae alimentum esse sicut in marinis solis.

224 CV. Altissimum mare XV stadiorum Fabianus tradit. alii in Ponto ex adverso Coraxorum gentis (vocant βαθέα Ponti) trecentis fere a continenti stadiis inmensam altitudinem maris tradunt, vadis

[1] *v.l.* summam . . . aquam . . . profunda.

wide expanse of the sea, either because the sweet and liquid, which is easily attracted by fiery force, is drawn out of it, but all the harsher and denser portion is left (this being why in a calm sea the water at a depth is sweeter than that at the top, this being the truer explanation of its harsh flavour, rather than because the sea is the ceaseless perspiration of the land), or because a great deal of warmth from the dry is mixed with it, or because the nature of the earth stains the waters as if they were drugged. One instance is that when Dionysius the tyrant of Sicily was expelled from that position, he encountered the portent that on one day the sea-water in the harbour became fresh water.

Effects of moonlight.

CIV. The moon on the contrary is said to be a feminine and soft star, and to disengage moisture at night and attract, not remove it. The proof given for this is that the moon by her aspect melts the bodies of wild animals that have been killed and causes them to putrefy, and that when people are fast asleep she recalls the torpor and collects it into the head, and thaws ice, and unstiffens everything with moistening breath: thus (it is said) nature's alternations are held in balance, and there is always a supply, some of the stars drawing the elements together while others scatter them. But the nutriment of the moon is stated to be contained in bodies of fresh water as that of the sun is in seawater.

Depth of seas.

CV. According to the account of Fabianus, the deepest sea has a depth of nearly two miles. Others report an immense depth of water (called the Black Sea Deeps) off the coast of the Coraxi tribe on the Black Sea, about 37 miles from land, where soundings

numquam repertis. CVI. Mirabilius id faciunt aquae dulces iuxta mare ut fistulis emicantes. nam nec aquarum natura miraculis cessat. dulces mari invehuntur, leviores haut dubie. ideo et marinae, quarum natura gravior, magis invecta sustinent. quaedam vero et dulces inter se supermeant alias, ut in Fucino lacu invectus amnis,[1] in Lario Addua, in Verbanno Ticinus, in Benaco Mincius, in Sebinno Ollius, in Lemanno Rhodanus, hic trans Alpes, superiores in Italia, multorum milium transitu hospitali suas tantum nec largiores quam intulere aquas evehentes. proditum hoc et in Oronte amne
225 Syriae multisque aliis. quidam vero odio maris ipsa subeunt vada, sicut Arethusa, fons Syracusanus in quo redduntur iacta in Alpheum qui per Olympiam fluens Peloponnesiaco litori infunditur. subeunt terras rursusque redduntur Lycus in Asia, Erasinus in Argolica, Tigris in Mesopotamia; et quae in Aesculapi fonte Athenis mersa sunt in Phalerico redduntur. et in Atinate campo fluvius mersus post XX milia passuum exit, et in Aquileiensi Timavus.
226 Nihil in Asphaltite Iudaeae lacu qui bitumen gignit mergi potest, nec in Armeniae maioris Aretissa; is quidem nitrosus pisces alit. in Salentino iuxta

[1] ⟨Pitonius⟩ amnis *ex* XXXI. 41 *Mayhoff*.

have never reached bottom. CVI. This is rendered more remarkable by springs of fresh water bubbling out as if from pipes on the seashore. In fact the nature of water also is not deficient in marvels. Patches of fresh water float on the surface of the sea, being doubtless lighter. Consequently also sea-water being of a heavier nature gives more support to objects floating upon it. But some fresh waters too float on the surface of others; cases are the river carried on the surface of Lake Fucino, the Adde on the Lake of Como, the Ticino on Maggiore, the Mincio on Garda, the Ollio on Lago d'Iseo, the Rhone on the Lake of Geneva (the last north of the Alps, but all the rest in Italy), after a passing visit that covers many miles carrying out their own waters only and no larger quantity than they introduced. This has also been stated in the case of the river Orontes in Syria and many others. But some rivers so hate the sea that they actually flow underneath the bottom of it, for instance the spring Arethusa at Syracuse, in which things emerge that have been thrown into the Alpheus which flows through Olympia and reaches the coast in the Peloponnese. Instances of rivers that flow under ground and come to the surface again are the Lycus in Asia, the Erasinus in the Argolid and the Tigris in Mesopotamia; and objects thrown into the Spring of Aesculapius at Athens are given back again in Phaleron Harbour. Also a river that goes underground in the Plain of Atinas comes out 20 miles further on, as also does the Timavus in the district of Aquileia. In Lake Asphaltis in Judaea, which produces bitumen, nothing can sink, and also in the Aretissa in Greater Armenia; the latter indeed is a nitrous lake that supports fish. A lake near the town

Remarkable properties of rivers.

oppidum Manduriam lacus ad margines plenus neque exhaustis aquis minuitur neque infusis augetur. in Ciconum flumine et in Piceno lacu Velino lignum deiectum lapideo cortice obducitur, et in Surio Colchidis flumine adeo ut lapidem plerumque durans adhuc integat cortex. Similiter in flumine Silero ultra Surrentum non virgulta modo inmersa verum et folia lapidescunt, alias salubri potu eius aquae. in exitu paludis Reatinae saxum crescit et in rubro mari oleae virentesque frutices enascuntur.

227 Sed fontium plurimorum natura miro [1] est fervore, idque etiam in iugis Alpium, ipsoque in mari, ut inter Italiam et Aenariam in [2] Baiano sinu et in Liri fluvio multisque aliis. nam dulcis haustus in mari plurimis locis, ut ad Chelidonias insulas et Aradum et in Gaditano oceano. Patavinorum aquis calidis herbae virentes innascuntur, Pisanorum ranae, ad Vetulonios in Etruria non procul a mari pisces. In Casinate fluvius appellatur Scatebra, frigidus, abundantior aestate; in eo ut in Arcadiae [3] Stymphali nascuntur
228 aquatiles musculi. in Dodone Iovis fons cum sit gelidus et inmersas faces extinguat, si extinctae admoveantur accendit. idem meridie semper deficit, qua de causa ἀναπαυόμενον vocant; mox increscens ad medium noctis exuberat, ab eo rursus sensim deficit. in Illyricis supra fontem frigidum expansae

[1] *Rackham*: mira. [2] *Mayhoff*: ut in *aut* et in. [3] *v.l.* Arcadia.

[a] In Thrace.
[b] In the Sabine region from which the people of Picenum originally came, cf. III xviii.
[c] I.e. the petrified bark remains the surface of the log.

of Manduria in the Salentine district is full to the brim, and is not reduced when water is drawn out of it nor increased when water is poured into it. In the river of the Cicones [a] and in the Veline Lake of Picenum,[b] wood thrown into the water gets covered with a film of stone, and in the river Surius in Colchis this goes so far that the stone in most cases is covered with bark still lasting.[c] Similarly in the Sele beyond Sorrento not only twigs but also leaves immersed in the river become petrified, though apart from this its water is healthy to drink. Rock forms in the outlet of the marsh at Rieti, and olive trees and green bushes grow in the Red Sea.

Remarkable springs.

But the nature of a great many springs is of remarkably high temperature, and this is found even on the ridges of the Alps, and actually in the sea, for instance in the Gulf of Baiae between Italy and the Island of Ischia, and in the river Garigliano and many others. In fact fresh water may be drawn from the sea in a great many places, as at the Swallow Islands and at Aradus and in the Gulf of Cadiz. Green grass grows in the hot springs of Padua, frogs in those of Pisa, fishes at Vetulonia in Tuscany near the sea. A river in the district of Casino called the Bubbling Water is cold, and is fuller in summer; water voles are born in it, as they are in the Stymphalis of Arcadia. The Fountain of Jupiter at Dodona, though it is cold and puts out torches dipped in it, sets them alight if they are brought near to it when they are out. The same spring always stops flowing at noon, on account of which it is called the Wait-a-bit; later it rises again and towards midnight flows abundantly, thereafter gradually ceasing again. A cold spring in Illyria sets fire to clothes spread out

vestis accenduntur. Iovis Hammonis stagnum interdiu frigidum noctibus fervet. in Trogodytis fons Solis appellatur dulcis et circa meridiem maxime frigidus; mox paulatim tepescens ad noctis media
229 fervore et amaritudine infestatur. Padi fons mediis diebus aestivis velut interquiescens semper aret. in Tenedo insula fons semper a tertia noctis hora in sextam ab aestivo solstitio exundat, et in Delo insula Inopus fons eodem quo Nilus modo ac pariter cum eo decrescit augeturve. contra Timavom amnem insula parva in mari est cum fontibus calidis, qui pariter cum aestu maris crescunt minuunturque. in agro Pitinate trans Appenninum fluvius Novanus
230 omnibus solstitiis torrens bruma siccatur. in Falisco omnis aqua pota candidos boves facit. in Boeotia amnis Melas oves nigras, Cephisus ex eodem lacu profluens albas, rursus nigras Peneus, rufasque iuxta Ilium Xanthus, unde et nomen amni. in Ponto fluvius Astaces inrigat campos in quibus pastae nigro lacte equae gentem alunt. in Reatino fons Neminie appellatus alio atque alio loco exoritur annonae mutationem significans. Brundisi in portu fons incorruptas semper[1] praestat aquas navigantibus. Lyncestis aqua quae vocatur acidula vini modo temulentos facit; item in Paphlagonia et in agro Caleno.

231 Andro in insula, templo Liberi patris, fontem nonis Ianuariis semper vini sapore fluere[2] Mucianus

[1] *Brotier*: in spira (*aut om.*) *codd.*
[2] *v.l.* saporem fundere.

[a] In Campania.

above it. The swamp of Jupiter Ammon is cold by day and hot at night. A spring in the Cave-dwellers' territory called the Fountain of the Sun is sweet and very cold at midday, but then gradually warming, towards the middle of the night it becomes spoilt owing to its heat and bitter taste. The source of the Po always dries up at midday in summer as if taking a siesta. A spring on the Island of Tenedos after midsummer always overflows from 9 to 12 p.m.; and the spring Inopus on the island of Delos sinks or rises in the same way as the Nile and at the same times. On a small island in the sea at the mouth of the river Timavus there are hot springs that grow larger and smaller with the rise and fall of the tide. In the Pitino district across the Apennines the river Novanus is always hot at midsummer and dried up at midwinter. In the district of Falerii all the water makes oxen that drink it white. The Blackwater in Boeotia makes sheep black, the Cephisus flowing from the same lake makes them white, the Peneus again makes them black, and the river Xanthus at Ilium red, which gives the river its name. Mares pastured on the plains watered by the river Astaces on the Black Sea suckle their foals with black milk. The spring called Neminie in the district of Reate rises now in one place and now in another, indicating a change in the price of corn. A spring in the harbour at Brindisi always supplies pure water for mariners. The slightly acid spring called Lyncestis makes men tipsy, like wine; the same occurs in Paphlagonia and in the territory of Cales.[a]

It is accredited by the Mucianus who was three times consul that the water flowing from a spring in the temple of Father Liber on the island of

ter consul credit; dies[1] Θεοδοσία vocatur. iuxta Nonacrim in Arcadia Styx nec odore differens nec colore epota ilico necat; item in Liberoso Taurorum colle tres fontes sine remedio, sine dolore mortiferi. in Carrinensi Hispaniae agro duo fontes iuxta fluunt, alter omnia respuens, alter absorbens; in eadem gente alius aurei coloris omnes ostendit pisces, nihil extra
232 illam aquam differentes. in Comensi iuxta Larium lacum fons largus horis singulis semper intumescit ac residit. in Cydonea insula ante Lesbum fons calidus vere tantum fluit. lacus Sannaus in Asia circa nascente absinthio inficitur. Colophone in Apollinis Clari specu lacuna est cuius potu mira redduntur oracula, bibentium breviore vita. amnes retro fluere et nostra vidit aetas Neronis principis supremis, sicut in rebus eius retulimus.

233 Iam omnes fontes aestate quam hieme gelidiores esse quem fallit? sicut illa permira naturae opera: aes ac plumbum in massa mergi, dilatatum fluitare, eiusdemque ponderis alia sidere alia invehi; onera in aqua facilius moveri; Scyrium lapidem quamvis grandem innatare, eundemque comminutum mergi; recentia cadavera ad vadum labi, intumescentia attolli; inania vasa haud facilius quam plena ex-

[1] *v.l.* Διός.

Andros always has the flavour of wine on January 5th: the day is called God's Gift Day. To drink of the Styx near Nonacris in Arcady causes death on the spot, although the river is not peculiar in smell or colour; similarly three springs on Mount Liberosus in Taurica irremediably but painlessly cause death. In the territory of Carrina in Spain there are two adjacent springs of which one rejects all objects and the other sucks them down; another in the same nation makes all the fish in it look of a golden colour, although except when in that water there is nothing peculiar about them. In the district by the Lake of Como a copious spring always swells up and sinks back again every hour. A hot spring on the island of Cydonea off Lesbos flows only in the springtime. Lake Sannaus in Asia is dyed by the wormwood springing up round it. In the cave of Apollo of Claros at Colophon there is a pool a draught from which causes marvellous oracular utterances to be produced, though the life of the drinkers is shortened. Even our generation has seen rivers flow backward at Nero's last moments, as we have recorded in our history of that Emperor.

Universal properties of springs.

Again everybody is aware that all springs are colder in summer than in winter, as well as of the following miracles of nature: that bronze and lead sink when in mass form, but float when flattened out into sheets; that among objects of the same weight some float and others sink; that heavy bodies are more easily moved in water; that stone from Scyros in however large a mass floats, and the same stone broken into small pieces sinks; that bodies recently dead sink to the bottom but rise when they begin to swell; that empty vessels cannot be drawn out of

trahi; pluvias salinis aquas utiliores esse quam reliquas, nec fieri salem nisi admixtis dulcibus;
234 marinas tardius gelare, celerius accendi; hieme mare calidius esse, autumnale salsius; omne oleo tranquillari, et ob id urinantes ore spargere quoniam mitiget naturam asperam lucemque deportet; nives in alto mari non cadere; cum omnis aqua deorsum feratur, exilire fontes, atque etiam in Aetnae radicibus, flagrantis in tantum ut quinquagena, centena milia passuum harenas flammarum globo eructet. CVII.
235 (Namque et ignium, quod est naturae quartum elementum, reddamus aliqua miracula, sed primum ex aquis.)

CVIII. In urbe Commagenes Samosata stagnum est emittens limum (maltham vocant) flagrantem cum quid attigit solidi, adhaeret; praeterea tactus et sequitur fugientes. sic defendere muros oppugnante Lucullo, flagrabatque miles armis suis. aquis etiam accenditur; terra tantum restingui docuere experimenta.

CIX. Similis est natura naphthae: ita appellatur circa Babylonem et in Astacenis Parthiae profluens bituminis liquidi modo. hic magna cognatio ignium, transiliuntque in eam protinus undecumque visam. ita fertur a Medea paelicem crematam, postquam sacrificatura ad aras accesserat, corona igne rapto.

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[a] On the W. bank of the Euphrates.
[b] In the Mithradatic War, 74 B.C.

the water more easily than full ones; that rain water is more useful than other water for salt-works, and that fresh water has to be mixed with sea water for the salt to be deposited; that sea water freezes more slowly, and boils more quickly; that the sea is warmer in winter and salter in autumn; that all sea water is made smooth by oil, and so divers sprinkle oil from their mouth because it calms the rough element and carries light down with them; that on the high sea no snow falls; that though all water travels downward, springs leap upwards, and springs rise even at the roots of Etna, which is so hot that it belches out sands in a ball of flame over a space of 50 to 100 miles at a time. CVII. (For we must also report some marvels connected with fire, the fourth element of nature, but first those arising from water.)

CVIII. In Samosata the capital of Commagene [a] there is a marsh that produces an inflammable mud called mineral pitch. When this touches anything solid it sticks to it; also when people touch it, it actually follows them as they try to get away from it. By these means they defended the city walls when attacked [b] by Lucullus: the troops kept getting burnt by their own weapons. Water merely makes it burn more fiercely; experiments have shown that it can only be put out by earth. *Mineral pitch.*

CIX. Naphtha is of a similar nature—this is the name of a substance that flows out like liquid bitumen in the neighbourhood of Babylon and the parts of Parthia near Astacus. Naphtha has a close affinity with fire, which leaps to it at once when it sees it in any direction. This is how Medea in the legend burnt her rival, whose wreath caught fire after she had gone up to the altar to offer sacrifice. *Naphtha.*

236 CX. Verum in montium miraculis ardet Aetna noctibus semper, tantoque aevo materiam[1] ignium sufficit, nivalis hibernis temporibus egestumque cinerem pruinis operiens. nec illo tantum natura saevit exustionem terris denuntians. flagrat in Phaselitis mons Chimaera, et quidem inmortali diebus ac noctibus flamma. ignem eius accendi aqua, extingui vero terra aut fimo[2] Cnidius Ctesias tradit. eadem in Lycia Hephaesti montes taeda flammante tacti flagrant, adeo ut lapides quoque rivorum et harenae in ipsis aquis ardeant, aliturque ignis ille pluviis. baculo si quis ex his accenso traxerit
237 sulcum, rivos ignium sequi narrant. flagrat in Bactris Cophanti noctibus vertex, flagrat in Medis et in Sittacene,[3] confinio Persidis, Susis quidem ad Turrim Albam quindecim caminis, maximo eorum et interdiu. campus Babyloniae flagrat e[4] quadam veluti piscina iugeri magnitudine; item Aethiopum iuxta Hesperium montem stellarum modo campi noctu nitent. similiter in Megalopolitanorum agro, nam si intermisit ille iucundus frondemque densi supra se nemoris non adurens et iuxta gelidum fontem semper ardens Nymphaei crater, dira Apolloniatis suis portendit, ut Theopompus tradidit. augetur imbribus egeritque bitumen temperandum fonte illo ingustabili, et alias omni bitumine dilutius. sed
238 quis haec miretur? in medio mari Hiera et Lipara[5]

[1] *Rackham*: materia.
[2] *Mayhoff*: faeno.
[3] in Cissia gente (*cf. Hdt.* 6. 119) *Detlefsen.*
[4] e *add. Mayhoff.*
[5] et Lipara *add. Mayhoff coll. Strab.* VI. *p.* 277.

[a] In Lycia. [b] Now Afghan Turkestan.

Volcanic mountains

CX. But among mountain marvels—Etna always glows at night, and supplies its fires with fuel sufficient for a vast period, though in winter cloaked with snow and covering its output of ashes with hoar frost. Nor does nature's wrath employ Mount Etna only to threaten the lands with conflagration. Mount Chimaera in the country of Phaselis[a] is on fire, and indeed burns with a flame that does not die by day or night; Ctesias of Cnidos states that water increases its fire but earth or dung puts it out. Also the Mountains of Hephaestus in Lycia flare up when touched with a flaming torch, and so violently that even the stones of the rivers and the sands actually under water glow; and rain only serves to feed this fire. They say that if somebody lights a stick at it and draws a furrow with the stick, streams of fire follow it. At Cophantium in Bactria[b] a coil of flame blazes in the night, and the same in Media and in Sittacene the frontier of Persia: indeed at the White Tower at Susa it does so from fifteen smoke-holes, from the largest in the daytime also. The Babylonian Plain sends a blaze out of a sort of fishpool an acre in extent; also near Mount Hesperius in Ethiopia the plains shine at night like stars. Likewise in the territory of Megalopolis: for if that agreeable Bowl of Nymphaeus, which does not scorch the foliage of the thick wood above it and though near a cold stream is always glowing hot, ceases to flow, it portends horrors to its neighbours in the town of Apollonia, as Theopompus has recorded. It is augmented by rain, and sends forth asphalt to mingle with that unappetizing stream, which even without this is more liquid than ordinary asphalt. But who would be surprised by these things? During

insulae Aeoliae iuxta Italiam cum ipso mari arsere[1] per aliquot dies sociali bello, donec legatio senatus piavit. maximo tamen ardet incendio Theon Ochema dictum Aethiopum iugum, torrentesque solis ardoribus flammas egerit.

Tot locis, tot incendiis rerum natura terras cremat

239 CXI. Praeterea cum sit huius unius elementi ratio fecunda, seque ipsa pariat et minimis crescat a scintillis, quid fore putandum est in tot rogis terrae? quae est illa natura quae voracitatem in toto mundo avidissimam sine damno sui pascit? addantur his sidera innumera ingensque sol, addantur humani ignes et lapidum quoque insiti naturae attritique inter se ligni, iam nubium et origines fulminum: excedet profecto miracula omnia ullum diem fuisse quo non cuncta conflagrarent, cum specula quoque concava adversa solis radiis facilius etiam accendant

240 quam ullus alius ignis. quid quod innumerabiles parvi sed naturales scatent? in Nymphaeo exit e petra flamma quae pluviis accenditur; exit et ad aquas Scantias, haec quidem invalida, cum transit, nec longe in alia durans materia: viret aeterno hunc fontem igneum contegens fraxinus; exit in Mutinensi agro statis Volcano diebus. reperitur apud auctores

[1] *v.l.* insula Aeolia . . . arsit.

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[a] Probably Mount Kakulima in West Africa (not Ethiopia) is referred to.

[b] Or possibly 'concave lenses.'

[c] In Latium. [d] In Campania.

[e] The Feast of Vulcan in August.

the Allies' War Holy Island and Lipari among the Aeolian Islands near Italy burnt in mid sea for several days, as did the sea itself, till a deputation from the senate performed a propitiatory ceremony. Nevertheless the largest volcanic blaze is that of the ridge in Ethiopia called the Gods' Carriage,[a] which discharges flames that glow with truly solar heat.

In so many places and by so many fires does nature burn the countries of the earth.

Marvels of fire.

CXI. Moreover, as this one element has a fertile principle that engenders itself and grows out of the smallest sparks, what must be expected to happen in future among all these funeral pyres of the earth? What is the natural principle that pastures a most voracious appetite on the whole world while itself unimpaired? Add thereto the innumerable stars and the mighty sun, add the fires of man's making and also those implanted in the nature of stone and of timber rubbing against itself, and again the fire of clouds, and the sources of thunderbolts—and doubtless all marvels will be surpassed by the fact that there has ever been a single day on which there has not been a universal conflagration, when also hollow mirrors[b] facing the sun's rays set things alight more easily than any other fire. What of the countless small but natural eruptions of fire? In the river Nymphaeus[c] a flame comes out of a rock that is kindled by rain; also one comes out at the Scantian Springs,[d] not a strong one, it is true, as it passes away, and not lasting long on any substance which it touches—an ash tree shading this fiery spring is everlastingly green; one comes out in the district of Modena on the days appointed as sacred to Vulcan.[e] It is found in the authorities that in the fields lying

subiectis Ariciae arvis si carbo deciderit, ardere terram, in agro Sabino et Sidicino unctum flagrare lapidem, in Sallentino oppido Egnatia inposito ligno in saxum quoddam ibi sacrum protinus flammam existere, in Laciniae Iunonis ara sub diu sita cinerem
241 inmobilem esse perflantibus undique procellis; quin et repentinos existere ignes et in aquis et in corporibus, etiam humanis: Trasimenum lacum arsisse totum, Servio Tullio dormienti in pueritia ex capite flammam emicuisse, L. Marcio in Hispania interemptis Scipionibus contionanti et milites ad ultionem exhortanti arsisse simili modo Valerius Antias narrat. plura mox et distinctius; nunc enim quadam mixtura rerum omnium exhibentur miracula. verum egressa mens interpretationem naturae festinat legentium animos per totum orbem veluti manu ducere.

242 CXII. Pars nostra terrarum, de qua memoro, ambienti (ut dictum est) oceano velut innatans longissime ab ortu ad occasum patet, hoc est ab India ad Herculi[1] columnas Gadibus sacratas |LXXXV| LXVIII p., ut Artemidoro auctori placet, ut vero Isidoro, |XCVIII| XVIII. Artemidorus adicit amplius a Gadibus circuitu sacri promunturii ad promunturium Artabrum, quo longissime frons
243 procurrat Hispaniae, DCCCXCD. Mensura currit duplici via: a Gange amne ostioque eius quo se in Eoum oceanum effundit per Indiam Parthyenenque

[1] *Rackham*: Herculis.

[a] In Campania.
[b] In the S.E. point of Italy.
[c] Capo della Colonna.
[d] They fell in battle with the Carthaginians 212 B.C.

under Arezzo if charcoal is dropped on the ground, the earth is set on fire; that in the Sabine and Sidicine district[a] a stone flames up when oiled; that in the Sallentine town of Egnatia,[b] if wood is put on a certain sacred rock, a flame at once shoots up; that ashes on the altar of Juno at Lacinium,[c] which stands in the open air, remains motionless when stormy winds sweep over it in every direction. Moreover, it is recorded that sudden fires arise both in pools of water and in bodies, even human bodies: Valerius Antias tells that the whole of Lake Trasimene once was on fire; that when Servius Tullius was a boy a flame flashed out from his head while he was asleep; and that a similar flame burnt on Lucius Marcius in Spain when he was making a speech after the death of the Scipios[d] and exhorting the soldiers to revenge. Later we shall give more instances, and more in detail; for at the present we are displaying a sort of medley of marvels of all the elements. But leaving the interpretation of nature our mind hastens to lead the reader's attention by the hand on a tour of the whole world.

Dimensions of the inhabited earth from East to West.

CXII. Our own portion of the earth, which is my subject, swims as it were in the ocean by which, as we have said, it is surrounded; its longest extent is from East to West, *i.e.* from India to the Pillars consecrated to Hercules at Cadiz, a distance of 8,568 miles according to Artemidorus, but 9,818 according to Isidore. Artemidorus adds in addition from Cadiz round Cape St. Vincent to Cape Finisterre the longest projection of the coast of Spain, 890½ miles. The measurement runs by a double route; from the river Ganges and its mouth where it flows into the Eastern Ocean, through India and Parthyene to the

ad Myriandrum urbem Syriae in Issico sinu positam |LII| XV, inde proxima navigatione Cyprum insulam, Patara Lyciae, Rhodum, Astypalaeam in Carpathio mari insulam, Taenarum Laconicae, Lilybaeum Siciliae, Caralim Sardiniae |XXI| III, deinde Gades |XII| L, quae mensura universa ab Eoo mari efficit
244 |LXXXV| LXVIII. alia via, quae certior, itinere terreno maxime patet a Gange ad Euphraten amnem |LI| LXIX, inde Cappadociae Mazaca CCXLIV, inde per Phrygiam et[1] Cariam Ephesum CCCCXCIX, ab Epheso per Aegeum pelagus Delum CC, Isthmum CCXII·D, inde terra et Alcyonio mari et Corinthiaco sinu Patras Peloponnesi CII·D, Leucadem LXXXVII·D, Corcyram totidem, Acroceraunia CXXXII·D, Brundisium LXXXVII·D, Romam CCCLX, trans[2] Alpes usque ad Scingomagum vicum DXVIII, per Galliam ad Pyrenaeos montes Illiberim CCCCLVI, ad oceanum et Hispaniae oram DCCCXXXII, traiectu Gades VII·D, quae mensura Artemidori ratione |LXXXIX| XCV efficit.
245 Latitudo autem terrae a meridiano situ ad septentriones dimidio fere minor ab Isidoro[3] colligitur, |LIV| LXII, quo palam fit quantum et hinc vapor abstulerit et illinc rigor. neque enim id[4] deesse terris arbitror aut non esse globi formam, sed inhabitabilia utrimque inconperta esse. haec mensura currit a litore Aethiopici oceani, qua modo habitatur, ad Meroen DCCV, inde Alexandriam |XII| L, Rhodum DLXXXIV, Cnidum LXXXVI·D, Coum

[1] et *add. Rackham.* [2] trans *add. Rackham.*

Syrian city of Myriandrus situated on the Gulf of Scanderoon 5,215, from there by the shortest sea-route to the Island of Cyprus, from Patara in Lycia to Rhodes, to the island of Astypalaea in the Carpathian Sea, to Taenarus in Laconia, Lilybaeum in Sicily, Caralis in Sardinia, 213, thence to Cadiz 1,250, the total distance from the Eastern Sea making 8,568. Another route, which is more certain, extends mainly overland from the Ganges to the river Euphrates 5,169, thence to Mazaca in Cappadocia 244, thence through Phrygia and Caria to Ephesus 499, from Ephesus across the Aegean Sea to Delos 200, to the Isthmus 202½, thence by land and the Alcyonian Sea and the Gulf of Corinth to Patras in the Peloponnese 102½, to Leucas 87½, to Corfu ditto, to Acroceraunia 82½, to Brindisi 87½, to Rome 360, across the Alps to the village of Suze 518, through France to the Pyrenees at Granada 456, to the Ocean and the coast of Spain 832, across to Cadiz 7½—which figures by Artemidorus's calculation make 8,995 miles.

But the breadth of the earth from the south point to the north is calculated by Isidorus as less by about one half, 5,462 miles, showing how much the heat has abstracted on one side and the cold on the other. As a matter of fact I do not think that there is this reduction in the earth, or that it is not the shape of a globe, but that the uninhabitable parts on either side have not been explored. This measurement runs from the coast of the Ethiopic Ocean, where habitation just begins, to Meroe 705 miles, thence to Alexandria, 1,250, Rhodes 584, Cnidus 86½, Cos 25,

and from North to South.

[3] *Mayhoff* (ab *add. Rackham*): fere minoro.
[4] id *add. Rackham.*

XXV, Samum C, Chium XCIV, Mytilenen LXV, Tenedum XLIX, Sigeum promunturium XII·D, os Ponti CCCXII·D, Carambin promunturium CCCL, os Maeotis CCCXII·D, ostium Tanais CCLXVI, qui cursus conpendiis maris brevior fieri
246 potest. |XXI| X ab ostio Tanais Nili Canopicum[1] diligentissimi auctores fecere. Artemidorus ulteriora inconperta existimavit, cum circa Tanain Sarmatarum gentes degere fateretur ad septentriones versus. Isidorus adiecit |XII| L usque ad Thylen, quae coniectura divinationis est. ego non minore quam proxime dicto spatio Sarmatarum fines nosci intellego. et alioqui quantum esse debet quod innumerabiles gentes subinde sedem mutantes capiat? unde ulteriorem mensuram inhabitabilis plagae multo esse maiorem arbitror; nam et a Germania immensas insulas non pridem conpertas cognitum habeo.

247 De longitudine ac latitudine haec sunt quae digna memoratu putem. universum autem circuitum Eratosthenes (in omnium quidem litterarum subtilitate set[2] in hac utique praeter ceteros solers, quem cunctis probari video) CCLII milium stadiorum prodidit, quae mensura Romana conputatione efficit trecentiens quindeciens centena milia passuum, improbum ausum, verum ita subtili argumentatione comprehensum ut pudeat non credere. Hipparchus

[1] *Sic Detlefsen*: potest LXXIX. ab ostio Tanais nihil modicum (immodicum *Mayhoff*).
[2] *Mayhoff*: et.

Samos 100, Chios 94, Mitylene 65, Tenedos 49, Cape Sigeum 12½, Bosphorus 312½, Cape Carambis 350, mouth of Lake Maeotis 312½, mouth of the Don 266,—a route that by cutting down the crossings can be shortened. From the mouth of the Don to the Canopic mouth of the Nile the most careful authorities have made the distance 2,110 miles. Artemidorus thought that the regions beyond had not been explored, though admitting that the tribes of the Sarmatae dwell round the Don to the northward. Isidorus added 1,250 miles right on to Thule, which is a purely conjectural estimate. I understand that the territory of the Sarmatae is known to an extent not less than the limit just stated. And from another aspect, how large is the space bound to be that is large enough to hold innumerable races that are continually migrating? This makes me think that there is an uninhabitable region beyond of much wider extent; for I am informed that beyond Germany also there are vast islands that were discovered not long ago.

Dimension of circumference.

These are the facts that I consider worth recording in regard to the earth's length and breadth. Its total circumference was given by Eratosthenes (an expert in every refinement of learning, but on this point assuredly an outstanding authority—I notice that he is universally accepted) as 252,000 stades, a measurement that by Roman reckoning makes 31,500 miles—an audacious venture, but achieved by such subtle reasoning that one is ashamed to be sceptical.[a] Hipparchus, who in his refutation of

[a] Modern authorities say that, whatever his result, the method of Eratosthenes was sound. See Heath, *Greek Astronomy*, pp. 109 ff.

et in coarguendo eo et in reliqua omni diligentia mirus, adicit stadiorum paulo minus $\overline{\text{XXVI}}$.

248 Alia Dionysodoro fides (neque enim subtraham exemplum vanitatis Graecae maximum). Melius hic fuit geometricae scientia nobilis; senecta diem obiit in patria, funus duxere ei propinquae ad quas pertinebat hereditas. hae cum secutis diebus iusta peragerent, invenisse dicuntur in sepulcro epistulam Dionysodori nomine ad superos scriptam: pervenisse eum a sepulcro ad infimam terram, esse eam stadiorum $\overline{\text{XLII}}$. Nec defuere geometrae qui interpretarentur significare epistulam a medio terrarum orbe missam quod deorsum ab summo longissimum esset spatium et idem pilae medium. ex quo consecuta computatio est circuitum esse $\overline{\text{CCLII}}$ stadiorum pronuntiarentur.

CXIII. Harmonica ratio, quae cogit rerum naturam sibi ipsam congruere, addit huic rationi stadiorum $\overline{\text{XII}}$, terramque XCVI partem totius mundi facit.

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[a] I.e. 6 × 42,000, the length of the radius, taking π as 3.

Eratosthenes and also in all the rest of his researches is remarkable, adds a little less than 26,000 stades.

Dionysodorus (for I will not withhold this outstanding instance of Greek folly) has a different creed. He belonged to Melos, and was a celebrated geometrician; his old age came to its term in his native place; his female relations who were his heirs escorted his obsequies. It is said that while these women on the following days were carrying out the due rites they found in the tomb a letter signed with his name and addressed to those on earth, which stated that he had passed from his tomb to the bottom of the earth and that it was a distance of 42,000 stades. Geometricians were forthcoming who construed this to mean that the letter had been sent from the centre of the earth's globe, which was the longest space downward from the surface and was also the centre of the sphere. From this the calculation followed that led them to pronounce the circumference of the globe to be 252,000 [a] stades.

CXIII. To this measurement the principle of uniformity, which leads to the conclusion that the nature of things is self-consistent, adds 12,000 stades, making the earth the $\frac{1}{96}$th part of the whole world.

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